# S·A·E JOURNAL

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## About Authors

● C. Herbert Baxley *is SAE vice-president representing the Fuels and Lubricants Activity of the Society. This past summer he headed an SAE delegation which attended the Second World Petroleum Congress in Paris and visited European automotive centers. Mr. Baxley also represented the United States Government and the American Petroleum Institute at the Congress. He graduated from the Engineering School of Johns Hopkins University and continued in mechanical engineering at the Polytechnic Institute of Brooklyn. He has been connected with the petroleum industry for the past eight years, holding engineering positions with the Vacuum Oil Co., the Sinclair Refining Co., and the Socony-Vacuum Oil Co., before assuming his present duties as technical manager, International Aviation Associates, London. Mr. Baxley has held prominent offices in the Metropolitan Section of the SAE and is secretary of the Volunteer Group for Compression-Ignition Fuel Research.*

● Robert P. Gaylord *was on the engineering staff of the Goodyear Zeppelin Corp. engaged in research and testing, during the construction of the U.S.S. Akron and U.S.S. Macon. After their completion he supervised the flight and shed trials of both these dirigibles. For the past three years he has devoted most of his time to the study of tractor tire problems in the tire testing department of the Goodyear Tire and Rubber Co. Mr. Gaylord was graduated from the Armour Institute of Technology with a B.S. degree in 1925. For three years, before joining Goodyear Zeppelin, he did engineering work for stock fire insurance companies in Cleveland.*

● Frederick K. Glynn *has a long list of accomplishments in the SAE. Particularly interested in the Transportation and Maintenance Activity he has taken a leading part in the work of the Society as a whole. Elected a Councilor in 1930 he resigned the following year to accept the office of T. & M. vice-president. He has held the chairmanship of the Metropolitan Section, the National Membership Committee, the Automotive Transport Code*

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"Oh Boy!" bursts out Jimmy. "Beautiful!" exclaims mother. And dad, with his vest buttons strained by a prideful chest, buys the car.

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# Shop and Engineering Cooperation Keynotes Flint Production Meeting

FREQUENTLY bobbing up in session discussions and stressed at length by the Dinner speaker, the importance of close cooperation between production and engineering proved to be the underlying theme of the 12th SAE National Production Meeting, held in Flint, Mich., Dec. 8-10. Over 500 members and guests attended the three-day meeting into which were packed five spirited two-paper sessions, two comprehensive inspection trips, and a rousing Production Dinner.

Is industry woefully lacking in theoretical knowledge? . . . Is grinding an art or a science? . . . Is climb-hobbing a cure-all for gear-finishing problems? . . . Can the human element be eliminated from noise measurement? These are but a few of the moot questions raised in sessions that brought forth stimulating verbal tilts. Less controversial, but equally informative were discussions on the technique of making light cast-steel pistons; flow-line patterns in forgings; coordination in manufacturing; synthetic-resin enamels; accuracy in mass-production of gears; and timing the spotwelding process.

"When I first entered the automotive industry, cooperation between production and engineering was at its lowest ebb," recalled Arnold G. Lenz, Chevrolet Motor Co., speaking to more than 350 at the Production Dinner.

In those days, theoretical engineering was moving so fast, he pointed out, that it was always several steps ahead of production facilities and found itself stymied by lack of proper materials, and handicapped by the inability of the factory to meet its specifications. This situation, he continued, was no doubt responsible for the pulling apart of the production and engineering departments so that the engineer thought the production man was an incurable procrastinator, and the shop men looked on the engineer as an unreasonable aggravation.

To appreciate the improved cooperation between these departments, we only have to contrast the ease and promptness with which our production programs are now being carried out with the commotion, frantic effort, and terrific scrap losses of those early days. As an increasingly important factor in maintaining this close cooperation, Mr. Lenz pointed out that time is just as important an item in production planning as it is in design.

Although cooperation has improved considerably since those early days, Mr. Lenz warned that future problems will call for still closer cooperation between creative engineers and production men. From his rich production experience as a molder, coremaker, melter, foreman, superintendent, and executive, Mr. Lenz drew many anecdotes to illustrate his points.

C. A. Chayne of Buick was Dinner chairman; Michael A. Gorman, Editor, *Flint Journal*, acted as toastmaster. C. J. Lauer, AC Spark Plug Co., was chairman of the Flint Dinner Committee. Mr. Chayne also was general chairman of the Flint Committees that cooperated with the Production Activity Committee, of which SAE Vice-President William B. Hur-

**Arnold G. Lenz, assistant general manager of Chevrolet, speaker at the Production Dinner, urged designing engineers not to expect miracles over night from the production department.**

ley is chairman, to make the meeting a success. Concluding Mr. Lenz's speech a big-time stage show was put on by courtesy of the Flint Chamber of Commerce with the cooperation of the Flint Entertainment Committee, of which W. C. Haight, Buick Motor Co., was chairman.

A complete picture of Buick manufacturing processes was unfolded before the eyes of those attending the two inspection trips, the first through Fisher Body Plant No. 1, and the second through Buick Plant No. 66, covering the transmission, forge, coil spring sheet metal, axle, motor, and final-assembly departments. J. P. Heiss of Buick headed the Flint Plant Visits Committee.

### Revolutionary Methods Revealed

When Ford recently came out in regular production with a cast-steel, thin-walled piston that outperformed and was lighter than its aluminum-alloy predecessor, alert production engineers knew that there was an outstanding production story behind the achievement. In the opening session of the meeting devoted to pistons and forgings, William F. Pioch, Ford Motor Co., told this story in a paper entitled "Casting and Machining of Ford Cast-Steel Pistons." In Mr. Pioch's absence his paper was read by his assistant, Nevin L. Bean. In the second paper of the session, of which Leroy V. Cram, Chevrolet Motor Co., was chairman, L. A. Danse, Cadillac Motor Car Co., stressed the importance of obtaining the right flow-line pattern in forgings, in his paper called "Precision Forging."

"Production of the Ford cast-steel piston necessitated a continuous series of revolutionary features from its design to its final assembly," announced Mr. Pioch, "and the method of molding is a complete departure from any known practice."

During molding one of the outstanding developments in the foundry technique was a mechanical method for tucking the sand into the pocket of the cheek mold that forms the cored hole of the piston-pin boss, Mr. Pioch claimed, explaining how it brought uniformity consistently to the process by eliminating the human element.

The dome and outside diameter turning operation was named as being the key machining operation upon which the success of all following machining operations was contingent. The difficulty here, Mr. Pioch pointed out, was in obtaining a consistent accuracy of 0.005 in. total variation between the inside of an unmachined casting and a perfectly true periphery, adding that "small bumps of only about 0.006 in. in height on the inside surface loomed before us like mountains." After describing the special chuck that solved this problem, he carried his detailed description of machining operations through the cadmium-plating process to a close. In the entire machining phase there is less than 0.8 per cent scrap, he concluded.

**Chairmen of the three Flint Meeting Committees (*left to right*) W. C. Haight, Buick Motor Co., Entertainment; J. P. Heiss, Buick Motor Co., Plant Visits; and C. J. Lauer, AC Spark Plug Co., Dinner.**

**Michael A. Gorman, Editor, *Flint Journal*, was toastmaster at the Production Dinner.**

"We experimented with cast-steel pistons at Chevrolet some time ago," recalled Chairman Cram, "but we ran into trouble with fatigue-cracking after 25,000 or 30,000 miles on the larger size cars. However," he qualified, "we did not have as highly developed production technique nor did we work to such close limits."

To a question of William B. Hurley, Detroit Edison Co., Mr. Bean replied that there had been no trouble caused by cracking of the pistons in passenger cars on the road, but that oxidation-cracking in bus pistons had been experienced, which buses now use aluminum pistons. Cadmium plating of the pistons drew the interest of several discussers: Mr. Cram thought that a thinner coat would be satisfactory, whereas Robert B. Schenck, Buick Motor Co., and Mr. Danse wondered how the plating stood up after 25,000 miles or more of service – whether it would wear enough to cause scuffing. Mr. Bean's answer was that, although any plated piston may show a small high spot where the plating wears through after long service, Ford has had no scuffing trouble.

Samples of molds, castings, and the piston as it evolved through the various machining processes were on display at the meeting to supplement the paper's information.

Two Englishmen must be given a large share of the credit for the high ranking and efficiency of modern American drop forging, contended Mr. Danse in the introduction of his paper. The first was Massey, he continued, who developed the scheme of forging wax in vari-colored layers in a soft die to prove the flow characteristics of the die design prior to hardening of the die. Aitchison was the second, he went on, and he preached macro-etching of the forging to show flow lines until industry was forced to recognize the value of such a check. From their leadership, Mr. Danse continued, it has become known that:

The most important characteristic of a forging is that the flow lines or fibers should be parallel to the tensile stresses and across the shear on bending stresses met with in service and that, theoretically, the flow of metal in a forging should follow exactly the surface contour in highly stressed areas and should follow the main form of the forging throughout.

There should be no flash or excess metal that flows out at the parting except at unstressed areas.

Three other methods of putting over his points were employed by Mr. Danse after he had finished reading his paper: In an informal blackboard talk he showed how the "split-and-spread" method of forging ring-gears gave poor flow lines that explained why they distorted unevenly in heat-treating and have teeth of uneven strength, and how buckled flow lines may be caused by too few hammer passes. He also employed etched samples showing good and poor flow-line patterns and motion pictures showing all forging and heat-treating operations performed on Cadillac connecting-rods.

Temperature control in forging is very important for two reasons, replied Mr. Danse to the query of F. P. Gilligan, Henry Souther Engineering Co., in order to get the proper plastic flow and to get the finishing temperature necessary for the forging to shrink to the proper size.

A discussion of the effect of connecting-rod cross-section on forging flow lines in which Mr. Schenck, Mr. Danse, and V. E. Hense, Buick Motor Co., participated, brought out that X-sections, round sections, and other deviations from the conventional give better flow lines but cost too much. A cruciform section, it was pointed out, not only would give good flow lines but would be ideal for rifle-drilling.

### Theory and Practice Get Together

A balanced diet of theory and practice of electric welding was served to an enthusiastic attendance of over 200 at the Electric Welding Session. Run jointly by the SAE and the American Welding Society, the session had two chairmen, F. W. Cederleaf, Diesel Equipment Corp., for the SAE, and Vaughan Reid of the American Welding Society.

"The greatest lack among engineers is a knowledge of the fundamentals of the subject," challenged Dr. C. A. Adams, drawing from long experience as a consulting engineer and professor at Harvard University, "and the teaching technique in modern engineering schools is brutally superficial." Eschewing a written paper or notes, Dr. Adams spoke extemporaneously on the subject "The Fundamentals of Electric Welding."

Lack of theoretical knowledge has cost industry millions of dollars, he continued, adding that the reason that he is highly paid for his consulting services is that he has more theory than have his clients. However, he qualified, the final solution cannot be reached alone by theory – it also requires mechanical resourcefulness and ingenuity. With the proper theoretical background, he explained, you can start with the fundamentals and build your own solution.

Reviewing the fundamentals of fusion welding, Dr. Adams explained the theory behind shielded arcs and slag-covered electrodes. As an example of the fundamental attack of a problem, he told how he had used it to upset traditional practice with the application of alternating current to give better results in welding large pressure vessels over the conventional direct-current method.

The economic phase of the welding picture was summarized by H. S. Card, National Electric Manufacturers Association, the first discusser. He pointed out the substantial contribution of welding to the development of the modern automobile – mentioning the all-steel top and welded frames as examples. The machine tools used to make your cars, also are largely welded, he continued, and welding improves the quality of their fuel by making possible better refining equipment.

Practice was brought into the session by Leroy V. Cram, Chevrolet Motor Co., who pointed out that, for certain applications, he had not been able to find a weld that would hold or stay put and is using rivets because he could depend upon them. If 99 per cent of the welds hold that is not enough, he contended, showing that, in a production of a million and a quarter fans, 1 per cent failure would be very costly. In reply Dr. Adams opined that, with the proper control and a uniform procedure, it should be possible to get a structure more than strong enough for the job.

The importance of the proper synchronization of current and pressure in spotwelding is not fully realized, believes J. S. Williams, P. R. Mallory & Co., in his paper "Recent Developments of Resistance Welding," which was read to the session by E. I. Larson of the same company. In his paper this importance was emphasized and data were presented to show the effect of certain conditions in the welding cycle on the structure and physical properties of the welds. Slides

**SAE Vice-President of the Production Activity, William B. Hurley (*left*) and C. A. Chayne, general chairman Flint Committees and Dinner Chairman, discuss events of the meeting.**

**SAE President Harry T. Woolson (*left*) and SAE President-Elect C. W. Spicer viewed the Flint Production Meeting with special interest**

showing micrographs of welds were used to illustrate the effect of improper synchronization of current and pressure and tests results to indicate its effect on the physical properties, comparing them with slides and figures of welds employing the proper timing.

Even though you have the adequate synchronizing control, you are not out of trouble, contributed George N. Sieger, S-M-S Corp., the best welder that you can get is needed – one who knows how to take care of the equipment. He then told of examples that he had seen of electrodes being carelessly overhauled. Electrodes are scientific, precision tools and should be treated as such, he concluded.

L. W. Clark, Detroit Edison Co., voiced a plea for cooperation among the welding manufacturer, customer, and power supplier to insure that an adequate power supply is available and to guard against welding troubles from this source.

### Coordination Program Outlined

What has to be done to make all the parts of an automobile meet at the same time at the assembly line and the production technique used in painting automobile parts with synthetic enamels were described in two papers at the session devoted to finishing and planning of which V. P. Rumely, Crane Co., was chairman.

When purchasing, planning, and scheduling of parts are coordinated with a high degree of accuracy, all parts for a given automobile will converge on the assembly line within a minute of each other – and this coordination is the secret of success in automobile manufacture – concluded David A. Wallace, Chrysler Corp., in his paper "Purchasing, Planning, and Scheduling Parts for Building Multiple-Model Automobiles."

Problems of manufacture are complicated by the wide variety of models, body types, paint and trim combinations, and of special orders demanded by customers, Mr. Wallace pointed out. To avoid waste of time in manufacture and delays in deliveries to dealers, automobile factories have devised elaborate systems of follow-up, he continued, and a teletype system operates between departments at the Chrysler plant to expedite this follow-up. At times it is necessary to charter an airplane to ship parts to the factory to prevent production delays, he explained. The definite program of coordination used at Chrysler was outlined by Mr. Wallace, and production methods of body building and finishing were discussed in detail.

William B. Hurley, Detroit Edison Co., called attention to the fact that the Chrysler Corp., with the cooperation of his company, had pioneered the development of an induction-type furnace using 360-cycle current for use in drying and baking automotive parts. One reason why this method is cheaper than oil or gas heating, he pointed out, was that, with conveyor hooks made of non-magnetic material, no heat is wasted in heating them up, the furnace heating only the magnetic parts.

As an example of the ease with which production can be disrupted, Mr. Wallace recalled the time when someone moved 17 bodies out of their place in the production line by mistake. "We were assembling both Plymouths and DeSotos on the same line at that time, he explained, and cars started coming through with some parts Plymouth and some parts DeSoto – it was an awful mess. We had to shut down the line and start all over again. That one mistake cost $40,000."

"The latest change in the finish of cars is to synthetic-resin enamels," reported J. L. McCloud, Ford Motor Co., in a paper called "Finishing Automotive Parts in Synthetic-Resin Enamels." Improvement is obtained in time of application, the saving being due mostly to the ability to apply at one time more substantial coats, and to the diminished need for polishing, he went on. But the main improvement, he explained, has been in the increased durability of the film surface and the underneath layers.

Synthetic resins, he pointed out, are high-lustre paints composed of pigment, solvent, and binder of non-volatile vehicle made of synthetic resin. Soya-bean oil with the right proportion of china wood oil has proved best for the main part of the car surface, Mr. McCloud explained, and has captured the interest of both industrialist and farmers, the latter finding it an advantageous crop. A detailed description of colors, methods and processes of application, and durability exposure tests completed the paper.

Recent developments in nitrocellulose lacquers and enamels were reviewed by several discussers. R. K. Cathcart, E. I. du Pont de Nemours & Co., mentioned types that he claimed showed as good durability as the synthetic enamels with superior gloss retention in the light colors in some cases. E. H. Heaton, Detzler Color Co., emphasized the marked improvement in the durability of lacquers and that their materials can be selected for durability rather than workability in repair.

Answering a question of Joseph Geschelin, *Automotive Industries*, as to the provisions made for servicing synthetic enamels in the field, Mr. McCloud replied that banks of lamps and color materials are supplied to dealers and service organizations who are being instructed to handle the new enamels.

### Grinding an Art or a Science?

Results of an effort to make grinding a more exact science and the production set-up necessary to build automatic transmissions were given a good going over in the session devoted

(*Continued on page* 25)

# S·A·E
# ANNUAL MEETING

BOOK-CADILLAC HOTEL
DETROIT, MICHIGAN
JANUARY 10-14, 1938

## S·A·E
## *Annual Meeting Dinner*

Thursday-January 13th

***Make Reservations Now!***

***Dinner Tickets $3.50***

**This year's *Dinner* is for Members and Applicants Only—Other sessions are open to everyone, as in the past.**

# SAE Annual Meeting . . .

## PROGRAM

### Monday, Jan. 10

**10:00 A.M.** — **Transportation and Maintenance**

J. M. Orr, Chairman

Economic Maintenance of a Concentrated Fleet of Large Trucks – G. W. Laurie, Atlantic Refining Co.

Economic Maintenance of a Concentrated Fleet of Mixed Vehicles – S. B. Shaw, Pacific Gas & Electric Co.

Economic Maintenance of a Scattered Fleet – H. O. Mathews, Public Utility Engineering & Service Corp.

**10:00 A.M.** — **Aircraft – Aerodynamics**

Peter Altman, Chairman

Practical Aerodynamics – Dr. Alexander Klemin and E. B. Schaefer, New York University

The Use of Generalized Logarithmic Graphs for the Calculation of Airplane Performance – Ivan L. Driggs, Glenn L. Martin Co.

**2:00 P.M.** — **Transportation and Maintenance**

F. K. Glynn, Chairman

What Fleet Operators Should Know About Tires – J. E. Hale, Firestone Tire & Rubber Co.

**2:00 P.M.** — **Aircraft Instrument Landing**

F. E. Weick, Chairman

Air-Track System of Aircraft Instrument Landings – G. L. Davies, Washington Institute of Technology

Radio Controlled Automatic Landing – Capt. G. V. Holloman, Wright Field

**8:00 P.M.** — **Junior-Student**

A. C. Hazard, Chairman

Previews of Progress – Demonstrations to be presented by E. L. Foss, General Motors Corp., Research Laboratories

The Automotive Engineer's Future – Roy H. Faulkner, Cord Corp.

### Tuesday, Jan. 11

**10:00 A.M.** — **Truck, Bus and Railcar**

S. Johnson, Jr., Chairman

The Outlook Toward Legal Performance Requirements – Prof. J. T. Thompson, Johns Hopkins School of Engineering

**10.00 A.M.** — **Aircraft Engine**

A. L. Beall, Chairman

Analysis of the Accessory Drive Problem on Aircraft Engines – R. P. Lansing, Eclipse Aviation Corp.

Analysis of Improvements in Aviation Spark Plugs – A. W. DeChard and T. Tognola, Scintilla Magneto Co., Inc.

**2:00 P.M.** — **Aircraft Engine**

William Littlewood, Chairman

Engine Installation and Related Problems in Large Aircraft – I. L. Shogran, Douglas Aircraft Co.

Accessory Knock Suppressors – L. B. Kimball, Fuel Development Corp.

**7:45 P.M.** — **Business Session**

President H. T. Woolson, in the Chair

Nomination and Election of Members-at-Large of Annual Nominating Committee

Announcement of Election of Officers for 1938

Presentation of Life Membership to Past-President W. B. Stout

**8:00 P.M.** — **Passenger Car Safety**

Norman Damon, Chairman

The Motor Vehicle Administrator Looks at the Automobile – C. A. Harnett, Commissioner of Motor Vehicles, State of New York

### Wednesday, Jan. 12

**10:00 A.M.** — **Passenger Car and Body**

L. L. Williams, Chairman

Air Conditioning of Automobiles and Buses, Winter and Summer – L. W. Child, Evans Products Co.

*E. H. Smith, Chairman for Discussion*

**2:00 P.M.** — **Passenger Car Noise**

W. C. Keys, Chairman

New Technique for Noise Reduction – Dr. E. J. Abbott, Physicists Research Co.

**8:00 P.M.** — **Production**

W. B. Hurley, Chairman

An Appraisal of Current Progress in Automotive Manufacturing – Joseph Geschelin, Detroit technical editor, *Automotive Industries*

The Use of Self-Tapping Screws in Mechanical and Structural Assemblies – Ralph Upson, Consulting Engineer

### Thursday, Jan. 13

**10:00 A.M.** — **Diesel Engine**

T. B. Rendel, Chairman

The Diesel as a High Output Engine for Aircraft – E. G. Whitney and H. H. Foster, National Advisory Committee for Aeronautics

Diesel Engine Deposits as Influenced by Fuel Types and Operating Conditions – J. R. MacGregor and W. V. Hanley, Standard Oil Co. of California

# *Book-Cadillac Hotel, Detroit, Mich.*

**2:00 P.M.** **Fuels and Lubricants**

C. H. Baxley, Chairman

The Reduction of Wear of Piston Rings and Cylinders – Macy O. Teetor, Perfect Circle Co.

Effect of Oil Characteristics on Wear in Aviation Engines – Dr. O. C. Bridgeman and M. L. Leidig, National Bureau of Standards

What Is an E. P. Product? – J. A. Moller, Pure Oil Co.

**6:30 P.M.** **Dinner**

F. F. KISHLINE, Toastmaster

C. F. KETTERING
The Philosophy of "Research"

H. T. WOOLSON, President SAE

C. W. SPICER, President-Elect

(Dinner limited to SAE members and applicants only)

**Friday, Jan. 14**

**10:00 A.M.** **Diesel Engine**

A. W. Pope, Jr., Chairman

Diesel Supercharging – Its Effect on Engine Design Features and Performance – Russell Pyles, Clark Brothers Co.

General Consideration of the Supercharging of Diesel Engines – Harte Cooke, American Locomotive Co.

**2:00 P.M.** **Fuels and Lubricants**

A. G. Marshall, Chairman

C.F.R. Motor Survey – J. B. Macauley, Jr., chairman, Motor Survey Section

C.F.R. 1937 Road Knock Tests – T. A. Boyd, chairman, Road Test Planning Group

Effect of Test Conditions on Fuel Rating, C.F.R. Report – A. E. Becker, chairman, Laboratory Procedure Group

Carburetion, Manifolding and Fuel Antiknock Value – Earl Bartholomew, Harold Chalk, and Benjamin Brewster, Ethyl Gasoline Corp.

**8:00 P.M.** **Fuels and Lubricants**

J. B. Macauley, Jr., Chairman

High Speed Motion Pictures of Engine Flames Correlated With Pressure Cards – Gerald M. Rassweiler and Lloyd Withrow, Research Division, General Motors Corp.

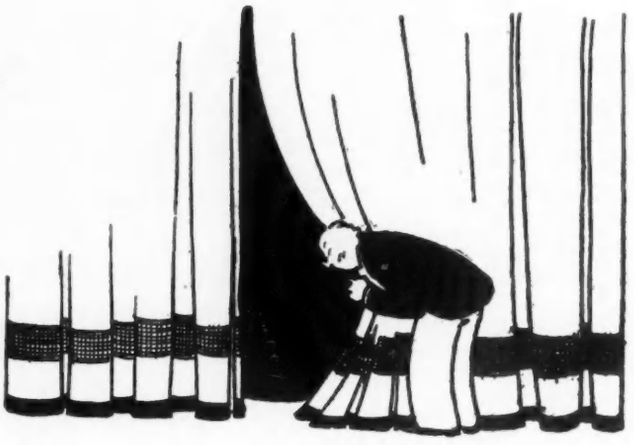
## Engineering Exhibit

*Every inch of space has been taken for the 1938 Engineering Exhibit, a feature of the SAE Annual Meeting. The following companies will have displays:*

**Acheson Colloids Corp.**
**Air Reduction Sales Co.**
**Aluminum Aircell Insulation Co.**
**Aluminum Co. of America**
**Baldwin-Southwark Corp.**
**Campbell, Wyant & Cannon Foundry Co.**
**Cities Service Co.**
**Cleveland Graphite Bronze Co.**
**DeLuxe Products Corp.**
**Doehler Die Casting Co.**
**Dole Valve Co.**
**E. I. du Pont de Nemours & Co., Inc.**
**Fleming Manufacturing Co., Inc.**
**Ford Motor Co.**
**Garlock Packing Co.**
**Gemmer Manufacturing Co.**
**Hercules Motors Corp.**
**International Nickel Co.**
**Koppers Co.**
**Monroe Auto Equipment Co.**
**J. W. Mortell Co.**
**Motor Improvements, Inc.**
**Ohio Crankshaft Co.**
**Rohm & Hass Co.**
**Spicer Manufacturing Corp.**
**Sunnen Products Co.**
**Thiokol Corp.**
**Timken Roller Bearing Co.**
**United American Bosch Corp.**
**Victor Manufacturing & Gasket Co.**
**Waukesha Motor Co.**
**Wilson Welder & Metals Co.**
**Wyman-Gordon Co.**
**S. S. White Dental Manufacturing Co.**
**Zollner Machine Works**

Behind the Scenes

# With the Committees



### Standard Approved

A REVISED standard for twist drills, submitted to the Society as a co-sponsor by the Sectional Committee on Small Tools and Machine Tool Elements under the procedure of the American Standards Association, was approved by the SAE Council at its last meeting, subject to a letter ballot of the General Standards Committee. If the letter ballot is favorable, it will be submitted to the Standards Council of the American Standards Association for approval as an American Standard.

### Lubricants

Since the introduction of hypoid gears in rear axles a subdivision appointed under the lubricants division of the Standards Committee has studied the present SAE classification of lubricants for axles and transmissions appearing in the SAE HANDBOOK. Result: a recommended reclassification eliminating one grade of oil and indicating more directly the relation to seasonal temperatures. Work is progressing on a study as to the possibility of a similar reclassification of crankcase oils.

### Voltage

TO overcome problems arising in determining the proper voltage rating for electrical equipment on Diesel-powered vehicles, a conference of the various groups concerned with the problem is being arranged by the electrical equipment division of the Standards Committee. Object: to work out a standard for the voltage ratings of this type of equipment. The establishment of a standard method for rating generators will also be considered.

### Heptane

The C.F.R. Motor Fuels Section has adopted, as a tentative specification, the proposal of the National Bureau of Standards for certifying the purity of normal heptane. This and a previously approved specification for iso-octane have been adopted by the C.F.R. Committee.

### Bearings

NEW SAE and American Standards for angular ball-bearings of the extra light type, and the metric equivalents of the inch widths of the wide type ball-bearings have been recommended by the ball and roller bearing division of the SAE Standards Committee and the Sectional Committee which is sponsored by the SAE and the A.S.M.E. under the American Standards Association procedure.

Later on, these recommendations will be submitted to standardizing bodies of other nations for acceptance as a world-wide standard through the International Standards Association.

### *Action!*

**● THE SAE Standard for storage batteries is being reviewed and recommendations have been made to bring it up to date in view of recent innovations in battery installations and changing battery requirements. The committee doing the job represents battery and automobile manufacturers. Particular attention is being given to the standard ratings and battery-case dimensions.**

**● DATA on modern spring requirements and specifications, gathered from both automobile and spring manufacturers, will be the basis of an entirely new set of spring specifications to include the new coil type of suspension spring. – Passenger Car Division (Standards)**

**● FOLLOWING two years' research conducted with the cooperation and practically unanimous approval of trailer manufacturers and users, recommended safety features involving trailer couplings have been developed by a subcommittee and are being considered for approval by the Highway Research Committee.**

**● A C.F.R. Automotive Diesel Fuels Section has been authorized, taking over the sponsorship of the work of the Volunteer Group on Compression Ignition Fuel Research.**

**● A FUTURE program on crankcase oil oiliness involving the application to wear tests of a supercharged C.F.R. engine with a wet-liner cylinder is being considered. – Crankcase Oil Oiliness (Research)**

### The I.C.C. and Safety Glass

LIMITATIONS placed on use of the heat-treated type of safety glass by motor carrier safety regulations of the Interstate Commerce Commission were the center of argument at public hearings recently held by the Commission.

Mentioned in the regulations and involved as a reference in the dispute was the American Standards Association standard code for safety glass completed about two years ago with the cooperation of a special SAE advisory committee appointed under the passenger car division of the Standards Committee.

Members of this SAE advisory committee, along with other representatives of the automotive industry, took an active interest in these public hearings which were completed about Dec. 1. I.C.C. rulings on the questions raised at issue had not been made as this issue went to press.

### Gasoline

Copies of the 1937 Summer Gasoline Survey Report, compiled by the C.F.R. Committee and the United States Bureau of Mines, will soon be off the press and available, without charge, from the Bureau.

### Vapor Lock

In a survey of fuel systems in existing models of airplanes and in those which will be in production within the next few months, three members of the C.F.R. Aviation Vapor Lock Steering Commit-

tee met in Los Angeles, following the SAE National Aircraft Production Meeting, and visited the Douglas, Lockheed, North American, Vultee, Consolidated and Boeing plants.

Following the inspection at the various plants, which was made in cooperation with the Air Corps and the Bureau of Aeronautics, these men continued similar inspections at the Naval Air Station, San Diego.

## Lighting Equipment

SAE laboratory test specifications covering the various lighting units on motor-vehicles, widely used by the industry, the Interstate Commerce Commission and state motor-vehicle administrators, have been reviewed from the standpoint of greater safety under present night driving conditions. Some requirements have been adjusted and the text has been rearranged so that all specifications read more clearly.

## Knock Rating

THE report of the C.F.R. Road Knock-Rating Tests, which were conducted last Spring, has been recommended as the basis of analysis and research, if necessary, to determine laboratory tests which will correlate with road results.

This report and the report of a C.F.R. group investigating laboratory method modifications were the basis of two papers presented at the A.P.I. meeting in Chicago, Nov. 12. Two corresponding papers are scheduled for a Fuels and Lubricants Session at the SAE Annual Meeting, Detroit, Jan. 10-14.

## Steel

SAE Steel and Iron Specifications are receiving a thorough going over by the iron and steel division of the Standards Committee. A similar study conducted three years ago resulted in adoption, by the Society, of many new steel compositions and the discontinuance of several specifications that were rapidly going out of use. Specifications for piston-ring and cylinder irons were adopted at that time.

## Aviation Fuels

The scope of the C.F.R. Fuels Survey Section has been expanded to include foreign and domestic aviation fuels and foreign motor fuels. A. L. Beall has been named head of the aviation fuels survey project.

## Concentric or Eccentric?

ONE of the common items on working drawings which causes misunderstandings is the diversity of ways in which the eccentricity or concentricity of circular dimensions is specified. The Committee on Methods of Expressing Limits and Tolerances is preparing a standard definition and method for indicating the permissible lack of concentricity in circular mating parts.

# SAE *Coming* EVENTS

**Baltimore—No meeting**

**Buffalo—No meeting**

**Canadian—Jan. 19**

Royal York Hotel, Toronto; dinner 7:00 P.M. The Value of the Automotive Industry to Canada – James C. Armer, vice-president, Dominion Forge & Stamping Co. Ltd.

**Chicago—No meeting**

**Cleveland—No meeting**

**Detroit—Jan. 10-14**

Book-Cadillac Hotel. Participation in Annual Meeting of the Society.

**Indiana—Jan. 20**

Severin Hotel, Indianapolis; dinner 6:30 P.M. The Oldsmobile Automatic Transmission and Its Application–Harold T. Youngren, chief engineer, Olds Motor Works.

**Metropolitan—Jan. 24**

The Roger Smith, 40 E. 41st St., New York City; dinner 6:30 P.M. Fuels and Lubricants Meeting.

**Milwaukee—No meeting**

### Annual Meeting

Jan. 10-14, 1938 Detroit
Book-Cadillac Hotel

### National Passenger Car Meeting

March 28-30, 1938 Detroit
Hotel Statler

### National Aeronautic Meeting

March 10-11, 1938 Washington, D.C.
Mayflower Hotel

### Summer Meeting

June 12-17, 1938
White Sulphur Springs, W. Va.
The Greenbrier

**New England—Jan. 11**

Walker Memorial, M.I.T., Cambridge, Mass.; dinner 6:30 P.M. Automatic Transmissions and New Suspensions – Frank E. H. Johnson, general service manager, Noyes Buick Co.

**Northern California—Jan. 11**

Engineers Club, San Francisco; dinner 6:30 P.M. Motor Bearings – R. A. Watson, Pacific Coast service engineer, Federal Mogul Corp.

**Northwest—Jan. 14**

Mayflower Hotel; Seattle, Wash.; dinner 6:30 P.M. Metals – Prof. B. T. McMinn, University of Washington.

**Oregon—Jan. 14**

Imperial Hotel, Streamline Room, Portland; dinner 6:30 P.M. Radio Interference – Professor Starr, Oregon State College. Recent Developments in Aviation – Professor Ruffner, Oregon State College.

**Philadelphia—No meeting**

**Pittsburgh—Jan. 21**

Webster Hall; dinner 7:00 P.M. Ladies' Night.

**Southern California—Jan. 14**

Hollywood Athletic Club, Los Angeles. Dinner 7:00 P.M. The Plotted Flight–Allen Barrie, senior captain, Western Air Lines.

**Southern New England—Jan. 5**

Hotel Bond, Hartford, Conn.; dinner 6:30 P.M. Our Laboratory Methods – J. O. Almen, General Motors Research Laboratories.

**Syracuse—Jan. 31**

Onondaga Hotel; dinner 6:30 P.M.

**Washington—No meeting**

# News of the Society

## Field Editors

*Baltimore* – Espy W. H. Williams
*Buffalo* – G. W. Miller
*Canadian* – Warren B. Hastings
*Chicago* – Austin W. Stromberg
*Cleveland* – William G. Piwonka
*Dayton* – R. H. Henry
*Detroit* – William F. Sherman
*Indiana* – Herman Winkler
*Kansas City* – No Appointment
*Metropolitan* – Leslie Peat
*Milwaukee* – Theodore L. Swansen
*New England* – J. T. Sullivan
*No. California* – C. W. Spring
*Northwest* – R. J. Hutchinson
*Oregon* – Sid Hammond
*Philadelphia* – H. E. Blank, Jr.
*Pittsburgh* – Murray Fahnestock
*St. Louis* – C. T. Schaefer
*So. California* – W. G. Chamberlin
*So. New England* – F. W. Mesinger
*Syracuse* – C. T. Doman
*Washington* – Capt. E. L. Cummings

# West Coast T. & M. Sessions Flash New Ideas on Carriers

THE belief of one speaker that truck overloading is greater among Pacific Coast than among Eastern operators was just one of a wide variety of striking ideas developed at the West Coast Regional Transportation and Maintenance Meeting held November 18-19 at the Fairmont Hotel, San Francisco, Calif.

Telegraphic advance advice of all unusual operations is provided to the shops where service is to be done on the streamliner train, "City of San Francisco," to make possible completion of necessary service work in the 29 hr. time allotted between runs, another speaker brought out. A bus operator said that current models weigh 4 tons less than did those of 1930 and carry more passengers, while a safety session speaker quoted records indicating that "overtaking" accidents exceeded accidents of the "approaching" type. Citing conclusions drawn from observation of 25,000,000 miles of operation by 115 Diesel engines in trucks, another speaker said: "There is little question that Diesel engines are more sensitive than the gasoline engines used in the past and they must be operated within a reasonably narrow range of speed and must have the cooling water kept warm."

So, throughout scores of other phases of automotive transportation and maintenance problems, differing ideas were developed, argued and explained.

Registration under the direction of Past Northern California Section Chairman E. C. Wood reached a total of 216. The meeting was opened by General Chairman S. B. Shaw.

A Railcar and Highway Session under the chairmanship of J. Verne Savage, superintendent of Municipal Shops, Portland, came first. E. B. Dailey, engineer of car construction, Southern Pacific Co., opened with "Maintenance of the Streamliner 'City of San Francisco.'" Mr. Dailey's paper dwelt upon the radically different maintenance methods necessary to care for a train 725 ft. in length and which could not be separated into individual cars and an engine, as is the case with the conventional steam train. Maintenance work must be done promptly because the train arrives from Chicago after a 4310-mile round trip, is available for service at about 9:00 A.M. and must leave the shop at 2:00 P.M. the following day to start the return trip.

Because the train is not laid up at any time for a longer interval for the purpose of a complete overhaul it is required that some cylinders of the two 16-cylinder Diesel engines be renewed during each service period; that some of the wheels be replaced and that a certain amount of painting work be done to keep the appearance of the train up to standard. Federal inspection and tests must also be attended to.

To permit this work to be done without delay, telegraphic advance advice of all unusual operations is provided to the shops where the service work is done.

Occasionally it is possible to commence some of the work prior to the train's arrival at the shop because on level ground one Diesel power unit can be shut down for work. It has also been found possible to handle emergency repair to engines while en route, it being possible to change a piston and cylinder sleeve in some 22 min. and a cylinder head in 12 min., the train meanwhile being operated on the other of the two engines.

Following the presentation of Mr. Dailey's paper, a general discussion took place concerning brake wear on high speed trains and the high cost of emergency stops where wheels are slid and therefore require removal and returning at the end of the run. The smooth operation of the Diesel train as compared to steam was commented on as was the effect of the ratio of unsprung to sprung weight on passenger comfort and train operating safety.

### Design of Highways

Turning from the question of rail transportation to that of highways for modern motor vehicles, the second paper, presented by Fred Grumm, engineer of surveys and plans, California State Division of Highways, on "The Economic Design of Highways," showed that until the last few years the policy had been to provide the most miles of road possible with the money available. More recently has been recognized the need of modernizing highways to meet the requirements of rapidly increasing traffic volume and speed.

Speaking of sight distances and visibility, Mr. Grumm remarked that the vertical curve (hill) with limited sight distance is more hazardous than the horizontal curve. Both types of sight distances are being adversely affected by the lowness of modern cars. Formerly a 5-ft. height of the driver's eyes above the ground was used but now it has been necessary to assume this to be 4½ ft. It was further pointed out that while the divided type of roadway is an effective method of increasing the visibility and safety of a highway, the cost of these roads is a distinct limitation. Realizing that many present roads will require subsequent widening and separation, all new construction is being designed to permit this expansion without undue cost. Mr. Grumm estimated that the safe comfortable capacity of the two-lane road is 1000 vehicles per hr. A three-lane road will handle twice that volume and a four-lane road 3200 vehicles if heavy vehicle movement does not exceed 10 per cent of the total volume. Analysis of traffic accidents has shown Mr. Grumm that the three-lane road constructed with proper regard to existing conditions and requirements is no more dangerous than a two or four-lane road.

Mr. Grumm's examination of accident records has shown him that the "overtaking" accident exceeds the "approaching" type, thus indicating the need for additional clearance to permit drivers to quickly and safely pass large slow-moving vehicles.

Mr. Grumm stressed the value of road lighting and remarked that it is difficult to judge the value of most lighted roads because such reports do not take into consideration lights from improvements adjacent to the road, as well as other contributing factors.

In closing Mr. Grumm pointed out that he considers that California roads are from 8 to 10 years behind what they should be for today's traffic volume and vehicles. Appreciative of this condition the highway engineer is planning as solidly as possible for the future but Mr. Grumm does not feel that the public obligation should extend beyond a transportation system which today's reasonably careful driver can use with safety and comfort.

Following the paper, S. B. Shaw, Pacific Gas and Electric Co., inquired as to what the State

was doing to prevent the loss of usefulness of major highways by interference from local traffic occasioned by the springing up of all sorts of business establishments adjacent to roads which had been primarily designed for through traffic and which had been built at the expense of the motorist and not the property owners. Mr. Grumm replied that it is somewhat difficult to prohibit the owner of the attached land from demanding entrance privileges to the highway. While expense is the governing factor, an effective but nevertheless costly manner in which to accomplish through traffic protection is to provide a local traffic road with a minimum number of intersections adjacent to the main highway.

G. L. Neely, Standard Oil Co. of Calif., inquired as to what was being done on uniformity of road striping as far as colors, stripe location, etc., were concerned. It was pointed out by Mr. Grumm that much of this work is awaiting a national agreement among states as to road signs, striping, etc., and that at the moment no attempt is being made to bring about uniformity among merely a small group of states.

After discussion on Mr. Grumm's paper, lunch for 48 members and guests was served under the chairmanship of A. H. LauFer, sales engineer, Marvel Carburetor Sales Co. The luncheon speaker was F. C. Patton, manager, Los Angeles Motor Coach Co.; the subject, "How Well Do You Know Your Company?" The presentation of this paper was augmented by the exhibition of a number of the graphical records used by Mr. Patton to make certain that the vehicles of his company are operated in such a manner as to give the type of transportation which will insure the greatest revenue. This means running an adequate but not an excessive number of vehicle miles and at the exact times of day when the traveling public requires transportation.

The afternoon Maintenance Session, under the chairmanship of Prof. A. B. Domonoske, executive head, mechanical engineering department, Stanford University, led off with a paper on, "Equipment Maintenance in a State Highway Department," by R. H. Stalnaker, equipment engineer, and F. E. Burnside, shop superintendent, Department of Public Works, Division of Highways, State of California. This paper, read by Mr. Stalnaker, pointed out that maintenance of the wide variety of vehicles required in the conduct of State business and their lack of concentration at any one point presented problems which are entirely absent in ordinary fleet maintenance. Several complete repair shops are maintained and the remainder of the work, except for major overhauls, is cared for by regional mechanics. During an ordinary winter it is necessary to attend to snow removal on about 3000 miles of road and in severe winters this mileage shows about a 50 per cent increase. Steam heated quarters must be maintained for a considerable amount of this snow equipment, some of which operates at altitudes in the neighborhood of 7000 ft. The personnel in charge of maintaining this equipment must be prepared for all types of emergencies because once heavy snow has accumulated its removal is much more difficult than if heavy drifts are prevented by regular preventive removal.

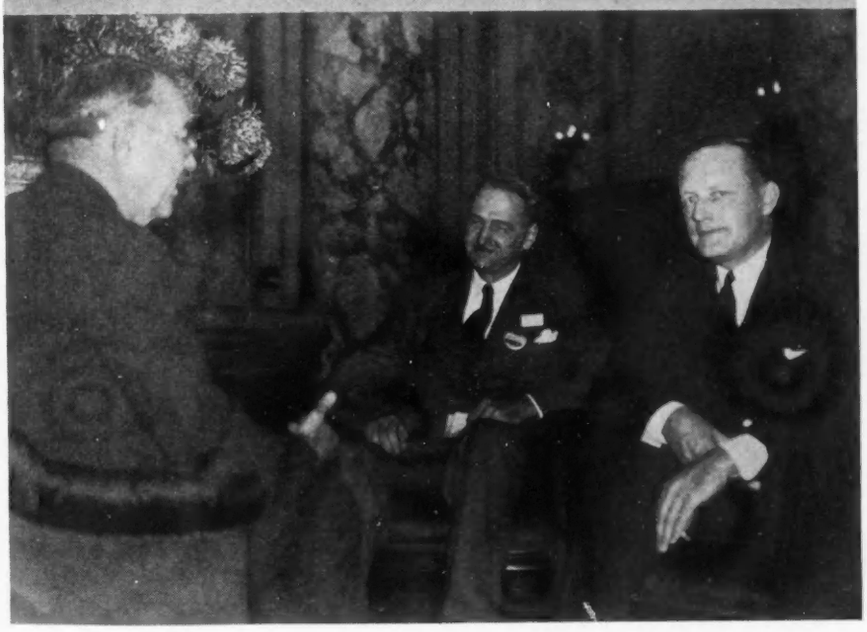
Turning to vehicles which use our roads rather than maintain them, a paper on "Motor Coach Maintenance Problems" by R. M. Ahrens, superintendent of maintenance and equipment, Pacific Greyhound Lines, was read by J. B. Rice. Mr. Ahrens' paper discussed maintenance procedure developed by his company in such a manner that over 31,000,000 miles of vehicle operation in 1936 was carried out with a minimum of delay and unnecessary expense despite

(*Continued on page 32*)

## General Chairman

**S. B. Shaw, automotive engineer, Pacific Gas & Electric Co., was general chairman of the two-day meeting.**

## At West Coast T. & M. Meeting



*Top (left to right):* **W. A. Birren, chairman, Southern California Section; L. J. Grunder, past-chairman, Southern California Section; F. C. Patton, luncheon speaker; M. N. Lefler, luncheon chairman; J. V. Savage, chairman, Railcar and Highway Session; R. N. Reinhard, past-chairman, Southern California Section; C. H. Jacobsen, California State Railroad Commission; Carl Abell, secretary, Southern California Section.**

*Bottom:* **A. K. Brumbaugh, luncheon speaker; G. L. Neely, banquet chairman and L. V. Newton, banquet speaker.**

## Spicer Reviews SAE Standardization Work

**● Metropolitan**

Industrial standards are akin to the hypotheses of the scientist, explained SAE President-Elect C. W. Spicer, vice-president, Spicer Manufacturing Corp., in his talk before a joint meeting of members and students of the Metropolitan Section, Dec. 15. His subject was "Standardization and Research Horizons," and he spoke with the authority of his long service as general chairman of the SAE Standards Committee. S. G. Tilden, chairman of the Metropolitan Section, directed the meeting.

These standards define our present state of progress and live only so long as they continue to define adequately, Mr. Spicer continued, contrasting the flexibility of industrial standards with the so-called fixed standards of science, such as the units of time or weight. "A statement which includes all that is really essential

of proved current knowledge needed to define the thing standardized, excluding all non-essentials," was Mr. Spicer's definition of a proper engineering or industrial standard. "In a word," he added, "it is a common meeting place for the purchaser, seller, and user."

From the first introduction of the idea in the automobile industry about 1902, Mr. Spicer reviewed the history of standards in the SAE and the industry. The earliest standards adopted, he recalled, were the ⅞-in. spark-plugs and a series of screws and nuts.

From a function of elemental engineering, Mr. Spicer concluded, standardization has expanded into a factor affecting the primary supplier, the engineer, the manufacturer, the seller, the buyer, the financer, the user, the servicer – in fact practically all who handle or use automotive products. It is a factor in labor relations, legislation and regulation, and is woven into practically all the elements of modern life.

Relating the rapid growth of SAE standardization and research to an ever-increasing demand for knowledge, John A. C. Warner, secretary and general manager of the Society, sees the SAE as a great educational enterprise whose influence is felt all over the world. "Attendance at meetings, or classes if you will, of our 22 sections exceeds 25,000 per year," he pointed out.

From experience in telephone equipment standardization work, F. K. Glynn, American Telephone and Telegraph Co., seconded many of Mr. Spicer's points in prepared discussion. "We must not let our zeal for standardization run away with us and standardize for standardization's rather than for economy's sake," he warned. Mr. Glynn also pointed out the danger of making standards into laws and freezing them so that future changes are impossible.

"The veneer of civilization is protected by the varnish of standardization," contributed J. A. Anglada, consulting engineer. Those that say that standards restrict, do not realize that they are changed whenever it is necessary, he added.

The close relationship between standardization and research was pointed out by T. C. Smith, American Telephone and Telegraph Co. One usually leads to the other he explained, and fast-changing items usually stay in research until they become more stable.

The reason that there are so many combinations of body, frame, engine, and other parts in the truck field with an apparent lack of standardization, replied Merrill C. Horine, Mack Manufacturing Corp., answering the queries of several discussers, is that we do not have standard loads, runs, or driving conditions – we cannot standardize the human being.

H. S. Cameron, chairman of the Metropolitan Section Student Activity, was responsible for a large student turnout.

## Moving Pictures Shown At SAE Student Meeting

**● Ohio State**

The Nov. 20 meeting of the Student Branch at Ohio State University was devoted to presentation of three moving pictures through the courtesy of the Chevrolet Motor Co. All Junior and Senior students in mechanical engineering, the faculty of that department and visiting students from other departments attended as guests of the Student Branch.

The first film was devoted to the theory of wirephoto, the second the pedestrian's conduct for his own safety and the third, with the historical advancement of industrial measurement.

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*Through the Student Branch the management of the Columbus Automobile Show gave free admission tickets to all Seniors in mechanical engineering.*

## *Horning Memorial Award Established*

In memory of the late Harry L. Horning, president of the Society in 1925, the Society will administer the awarding of a Harry L. Horning Memorial Medal, a certificate, and a cash award of $250 annually or less frequently to the author of the best paper "relating to the adaption of fuels to internal-combustion engines or the adaption of internal combustion engines to fuels," presented before the Society or any of its Sections during any calendar year. The award is made possible through a gift of Mrs. Elsie M. Horning in memory of her husband. The gift was accepted by the Council at its Dec. 10 meeting.

## Sees Radical Changes in Future Aircraft Engines

**● Washington**

The present four-stroke-cycle, poppet-valve, air-cooled, radial engine refined to the nth degree will give way to types now considered radical, according to John H. Geisse, chief of the development section Bureau of Air Commerce.

Presenting his paper on "Future Aircraft Engines" before the Washington Section, Dec. 14, Mr. Geisse, after classifying engineers as conservatives, progressives and visionaries, stated that engineers in the first group believe that the future development of aviation engines will be by detailed refinements of existing types. In the category of progressive engineers, he places those who may be said to have vision but are not visionary; who may be ahead of their conservative colleagues but are not ahead of their time. The visionary engineer, he said, is so far-sighted that "the nearest object he can see is at least a few generations away."

That a fair margin is left on which the visionary engineer may work was brought out by Mr. Geisse in his statement: "The power required to overcome the frictional resistance of a streamline container large enough to give the accommodations of a Douglas DC-3 at 160 m.p.h. is not over 100 hp. The energy in one pound of gasoline is 19,000 B.t.u. For 100 per cent efficiency 13.5 lb. of gasoline per hr. would be required to drive this streamline container at 160 m.p.h. We actually use 465 lb. per hr. on the DC-3, which gives an overall efficiency of 3 per cent." The above, he said, "is sufficient evidence that a detailed refinement of present equipment might some day be overshadowed by some departure from the conventional."

Proceeding with discussion of component parts, he stated: "The sleeve-valve engine, as developed by Bristol in England, has already shown the possibility of increasing compression ratio by one or more increments over that possible with the poppet valve with a corresponding reduction in specific fuel consumption." The British, he added, have a new rotary-valve engine about which information is now available. Compression ratios of 11 and 12:1 are claimed permissible with ordinary automobile spark-plugs and gasoline, and fuel consumption is said to be at the phenomenally low figure of 0.32 lb. per hp.-hr. Continuing he stated: "The metal utilization efficiency of the cylinder might be said to be 8 per cent. A constant-pressure Diesel cycle would improve this ratio of pressures, and a change from the four-stroke to the two-stroke cycle might improve it as much as 50 per cent." He also noted that the efficiency of metal utilization of the connecting-rod and piston is about 9 per cent. This efficiency might well be doubled by the use of double-acting pistons and more than doubled if the cycle were two-stroke Diesel.

That there is much that might be done in the matter of cooling systems other than detail refinement of cylinder finning, baffling, and cowling was shown by Mr. Geisse in discussing the possibilities of chemical, water-under-pressure, and steam-cooling. "Steam cooling has been used abroad and some work was done on it in this country but its possibilities have not been exhausted," he said, adding, "so far as I know, no one has even suggested, much less tried, the principle of the Still engine in which the waste heat of the jackets and exhaust are used in a steam powerplant. This combination reaches an efficiency higher than any obtained by other practical heat engines. For transatlantic flying where specific fuel consumption is of vital importance it might have possibilities."

After discussing figures which were not beyond the bounds of possibility, Mr. Geisse stated: "These facts, of which we are probably all aware, are brought out simply to show what tremendous possibilities there are for excelling the conventional engine with some unusual type. They will also serve to warn us against rejecting proposed designs for the sole reason that the inventor claims ¼ lb. per hp.-hr. and is therefore necessarily a nut. He could be right."

Vigorous discussion of Mr. Geisse's paper was given by many of the members present including Dr. George W. Lewis, Lieut. Com. R. Botta, Carlton Kemper, and F. E. Weick.

## Engine Reliability Seen As Factor in C.O.E. Trend

**● Pittsburgh**

It was because early engines were so temperamental that builders of horseless carriages moved them from their original under-the-seat position out in front where they would be more accessible, B. B. Bachman, vice-president and chief engineer of Autocar, told the Pittsburgh Section at its Nov. 16 meeting, in his paper, "Modern Conditions Demand Modern Trucks." The reliability of today's engines, he added, is a factor in the trend toward again locating the engine under the seat or behind the front axle in building commercial vehicles. This relocation enables the manufacturer to reduce the length of the vehicle, increase its maneuverability, and secure better weight distribution on pneumatic tires, he stated, adding that these factors permit a vehicle to carry maximum loads while conforming with legal restrictions.

Mr. Bachman explained the difference between the engine-under-seat and the cab-over-engine constructions, in which the engine is mounted ahead of the front axle and under or projecting through the floorboards. Except in a very limited field, he said, rear-mounted engines are not suited for truck use, although they are excellent for buses.

There were 61 at the dinner preceding the meeting, and more than 70 members and guests at the meeting.

Following Mr. Bachman's paper, Murray Fahnestock, editor of *Ford Dealer and Service Field*, read a paper dealing with the redesign of standard trucks by fleet operators to secure more loading space on snub-nosed trucks. He told how the members of the T. & M. Activity of the SAE have summarized their ideas as to what is wrong with motor trucks from the fleet operator's point of view. From this, he said, it was but a short step to redesigning standard trucks to meet the special requirements of their own individual fleets.

Mr. Fahnestock told how the Baltimore Transfer Co. has moved the cabs 18 in. forward on a large number of their trucks used for local hauling and store-door delivery, thus increasing the length of the available body space by that amount. A double recess in the dash provides

(*Continued on page* 30)

# National Production Meeting

(*Continued from page 16*)

to machining problems. W. H. McCoy, General Motors Research Co., was session chairman.

"Partly 'yes' and partly 'no,'" was the reply of R. V. Hutchinson, Olds Motor Works, to the question asked in the title of his paper "Do We Understand the Grinding Process?" Before reviewing the highlights of his comprehensive treatise, Mr. Hutchinson explained that his paper was not a declaration of fact but a recitation of general premises and a consideration of what he believes approximately happens.

"Grinding wheels will be selected by trial and error for some time to come in all probability," predicted Mr. Hutchinson, "although dynamometry may provide a series of guide posts to steer one's guessing." Showing a sketch of a suggested grinding-wheel dynamometer, Mr. Hutchinson pointed out that, if such a machine could be built, data could be obtained from which could be predicted the life and suitability of a given wheel for a given job.

A grinding wheel made by winding layers of wool yarn impregnated with abrasive on an arbor until the wheel reaches the desired diameter, was described in written discussion by Myron R. Churchill, in which he summarized the advantages claimed for it.

Pointing out the difficulties involved in changing the old art of grinding into a science, Herbert J. Griffing, Norton Co., in discussion prepared by several men in his company, stated that Mr. Hutchinson's results agree with those of other investigators although his mathematical approach is different.

The grinding-wheel industry is in the same condition as was the steel industry when it wouldn't give the customer an analysis, opined Karl L. Herrmann, Municipal Supply Co., decrying the waste and inefficiency of selecting grinding wheels on a cut-and-try basis. He recommended that, if grinding-wheel users owned testing dynamometers such as the one suggested by Mr. Hutchinson, they wouldn't have to depend upon the tests used by grinding-wheel engineers.

We use four different methods for scientifically grading wheels, was the answer of P. H. Clapp, Norton Co., to Mr. Herrmann's charge, naming modulus, sound, and penetration tests.

"Nearly 100 machine-tool builders contributed to the latest developments in equipment and processes to be found in the automatic transmission plant," announced F. C. Pyper, Buick Motor Co., in his paper "Peculiar Machining Problems in the Automatic Transmission." Highlights of the machining processes were described by Mr. Pyper and illustrated by slides.

As an engineer on the automatic-transmission job, P. L. Tenney, Buick Motor Co., commended Mr. Pyper and the production department on not fighting the specifications and close tolerances submitted to them, but accepting them and devising a new set-up.

That tolerances can be specified closer than the job warrants and cause needless expense was pointed out by J. E. Hacker, Winton Engine Mfg. Corp. "The draftsman often tosses half-thousandths blithely around on the drawing board when they are not required," he concluded.

The automatic transmissions were proved in the field for five years before they were put on the cars, explained Mr. Tenney in answer to the query of Col. O. B. Zimmerman. In these tests in which 50 cars were used, 50 different transmissions were tested, and hundreds of thousands of miles were covered, only two cars failed to come home on their own power, he recalled.

### Conventional Process Reversed

Advantages and disadvantages of climb-hobbing, a new machining technique, and problems connected with producing precision gears in large quantities were the subjects of spirited discussion following the reading of two papers at the final session of the meeting devoted to gears and splines and chairmanned by Joseph Geschelin, *Automotive Industries*.

Climb-hobbing reverses the conventional method of cutting gears and splines by starting the cutting action at the surface rather than at the root of the spline or gear tooth, and ending it at the root, explained R. B. Haynes, Spicer Manufacturing Corp., in his paper: "Recent Developments in Spline and Gear Cutting and Finishing."

Predicting wide adoption of the new technique, Mr. Haynes summarized the results of his experiments on this new method, among them being that the finish on the sides of the splines was far superior to that of the conventional method of cutting; the cutting tool had longer life; less power was needed. Mr. Haynes' paper is published in full on pages 1-3, TRANSACTIONS SECTION, this issue.

We found that hob life was longer with climb-hobbing regardless of steels used, type of lubricant, and other variables, was Mr. Haynes' reply to the question of R. A. Horner, Barber-Colman Co. However, he qualified, climb-hobbing is not suggested as a cure-all, but it is recommended to attempt to climb a new hob first.

"No doubt some early artisan, making a pair of wheels for his queen's chariot—and trying to get them accurate enough so she would not appear to be a shimmy dancer—was told by his scoffing contemporaries that it was unnecessary to make them round because the road wasn't flat and smooth anyway," speculated C. H. Stanard, Buick Motor Co., pointing out that accuracy was a problem, even in the earliest days, in the meeting's final paper: "The Economical Mass Production of Accurate Gears."

He stated that the purpose of this paper is to tell how problems of uniformity, accuracy, economy, and quantity are solved. This he proceeded to do in detail, stressing the importance of close cooperation with the metallurgical and forging departments in attaining these ends.

All gears are punched in the forge shop, Mr. Stanard told Chairman Geschelin, and then broached one cut to finish; he explained that this method had been found more economical than that of drilling out the hole.

"My pet peeve is the man with the trained ear," announced Mr. Haynes. "Isn't there any mechanical method for making uniform and consistent noise measurements?"

We tried out the method of using a microphone and amplifier, measuring the sound electrically in proportion to the amount of current generated, replied Mr. Stanard, but we found that the greatest amount of current was often generated when testing quiet gears. Mr. Stanard's explanation for this paradoxical result, was that, with noisy gears—that is, those that sounded noisy or disagreeable to the human ear—roughness broke down the sound waves and gave lower readings or, in other words, a gear set may be quieter than another and still have a greater total volume of sound.

Sound is made up of many components, contributed R. S. Drummond, National Broach & Machine Co. There are millions of tones in this room, but only the peaks are heard and are disagreeable, he continued, and what is needed is an instrument to indicate the quality of tone instead of its volume.

Supplementing Mr. Stanard's paper P. L. Tenney and C. L. Foreman, both of Buick, touched on other phases of Buick gear manufacture. An outline of heat-treatment developments by E. J. Hergenroether, International Nickel Co., Inc., concluded the session.

# About SAE Members:

*Gus P. Doll* has resigned as president of the Corcoran-Brown Lamp Co., Cincinnati, a division of the Electric Auto-Lite Co., to accept the presidency of Valvoline Oil Co., effective Jan. 1. Mr. Doll has been an officer of the lamp company since 1919 and its active operating head since 1926.

*Fred W. Cederleaf,* 1933 SAE vice-president representing production engineering, has been named general manager of the Diesel

**Fred W. Cederleaf**
*To Diesel Equipment Corp.*

Equipment Corp., Chicago. He was previously with the Ex-Cell-O Corp., Detroit, as manager of the machinery division.

*Ralph R. Teetor,* charge of engineering, Perfect Circle Co., and past-president of the SAE, was guest of honor of the Engineering Alumni Society of the University of Pennsylvania at its 28th annual meeting, Philadelphia, early last month. Mr. Teetor was a member of the class of '12.

*Roger L. Weider,* formerly laboratory engineer, White Motor Co., Cleveland, has been made experimental engineer.

*Gordon McIntyre,* who has been chief chemist for the Imperial Oil, Ltd., Sarnia, Canada, has been made manager of the company's technical sales department.

*Leslie Hamilton Middleton* has been named vice-president in charge of engineering by the Electric Auto-Lite Co., Toledo. Mr. Middleton was previously chief engineer of the company.

*Louis G. Gray* is district motor transport officer, United States Army, located at Camp Custer, Mich.

## SAE Members Honored

SAE members have been chosen as 1937 recipients of the two honorary fellowships awarded each year by the Institute of the Aeronautical Sciences. Glenn L. Martin, president of the Glenn L. Martin Co., Baltimore, has been named as the Institute's American fellow for his "outstanding achievements in the construction of notable aircraft of all types." A. H. R. Fedden, chief engineer of the Bristol Airplane Co. and designer of England's best known aircraft engine, was elected the Institute's foreign fellow.

Philip B. Taylor, chief engineer, Wright Aeronautical Corp., was named one of the ten fellows of the Institute selected for 1937.

*Orville Wright was guest of honor of the Institute on Dec. 17, the thirty-fourth anniversary of his and his brother Wilbur's first flight at Kitty Hawk, N. C. At the dinner the first annual Wright Brothers' Lecture was given by B. Melville Jones, Frances Mond Professor of Aeronautical Engineering at Cambridge University and a member of the British Aeronautical Research Committee.*

*John W. Lane,* secretary of the New England Section of the Society, has been transferred from Socony-Vacuum Oil Co., Boston office, where he was automotive engineer, to the company's East Providence, R. I., office where he will be in charge of all automotive activities in the district.

*Arthur N. Lappin,* formerly stress analyst, Michael Gregor, New York, is now affiliated with the Canadian Car & Foundry Co., Fort William, Ontario.

*Capt. E. V. Rickenbacker,* general manager and vice-president, Eastern Air Lines Division of North American Aviation, Inc., has been elected to the board of directors of the Air Transport Association of America.

*Dr. Ross P. Anderson,* secretary, division of refining, American Petroleum Institute, has been elected vice-chairman of the Standards Council of the American Standards Association.

*Leslie G. Collet,* former experimental engineer, National Superior Co., Springfield, Ohio, has joined the engineering tests department, General Motors Proving Grounds, Milford, Mich.

**F. C. Burk**
*Gets Promotion*

*Franklin C. Burk* has been appointed supervisor, automotive laboratory, The Atlantic Refining Co., Philadelphia. He formerly was assistant director of the laboratory.

*B. E. Sibley,* chief technologist, Continental Oil Co., Ponca City, Okla., has been named a member of a new American Petroleum Institute committee on motor fuels.

*Riichi Maeda,* formerly assistant professor at the Osaka Imperial University, has joined the Nissan Jidosha Kaisha, Ltd., as chief of their experimental department.

*Leslie F. Zsuffa* has joined the staff of the American Society of Mechanical Engineers, N. Y., as editorial assistant. He was previously with the United Parcel Service, N. Y.

*J. R. Kessler* is managing the Oregon Parts Co., Portland. He was formerly affiliated with the Roberts Motor Co., in the same city.

## I.A.E. Speakers

Maurice Platt, a foreign member of the Society, addressed the Institution of Automobile Engineers, London, Dec. 7, on the British national conditions as affecting automobile design. Maurice Olley and Alex Taub, SAE members, are scheduled to speak before the Institution in February and April, respectively. Mr. Olley's paper will deal with the effect of national conditions on automobile design in the United States, and Mr. Taub's paper will discuss fuel economy. All three men are on the engineering staff of Vauxhall Motors, Ltd., Luton, England.

*G. Adolph Wahl,* former tool designer with Bendix Products Co., South Bend, has joined the Diamond Chain & Manufacturing Co., Indianapolis, as designer.

*George W. Miller* has been elected president of the National Lubricating Grease Institute for the coming year. He is vice-presi-

**George W. Miller**
*Heads Grease Institute*

dent of American Lubricants, Inc., in charge of production and technical developments and is secretary-treasurer of the SAE Buffalo Section.

*William B. Stout,* president, Stout Engineering Laboratories, is a member of the committee of award for the United Air Lines Scholarships, sponsored by the United Air Lines Transport Corp. for deserving college men who have decided upon aviation as a vocation.

*Alfred P. Sloan, Jr.,* chairman of General Motors Corp., announced early last month, that he is donating securities worth approximately $10,000,000 to the Alfred P. Sloan Foundation, with the hope of promoting a wider knowledge of "basic economic truths."

*George Stowe* has resigned as vice-president of the Reo Sales Corp., New York, following 17 years with that company. Mr. Stowe has long been affiliated with the automotive industry. Before joining Reo he was branch manager for the Mitchell Motor Car Co., and prior to that was with Chalmers. He is a member of Automobile Merchants Association of New York board of directors and, for some years, served as the association's secretary-treasurer.

*G. Waine Thomas* has joined the Mack Manufacturing Co., Allentown, Pa., in an engineering capacity. Prior to this change he was

**G. Waine Thomas**
*Joins Mack*

chief engineer of the Reo Motor Car Co., with which he had been affiliated for ten years in truck and bus engineering capacities.

*William B. Wheatley* was one of the pilots who flew the Consolidated flying boat NC777 non stop from San Diego to Miami on Dec. 3 & 4 in 14 hr. 10 min. The plane was being delivered to Richard Archbold of the American Museum of Natural History. Mr. Wheatley is chief of flight testing and service manager for Consolidated Aircraft Corp.

# . . . . At Home and Abroad

*Ralph Baggaley, Jr.*, chairman of the Society's Pittsburgh Section, spoke before the Mechanical Engineers' Seminar at Carnegie Institute of Technology, Nov. 29.

*Frederick P. Baggerman*, a former student at the Massachusetts Institute of Technology, has joined the motor laboratory staff, Shell Petroleum Corp., St. Louis.

*H. F. Brown*, former Stearman Aircraft Co. plant superintendent, has been made vice-president in charge of manufacturing.

*E. E. Wilson*, senior vice-president of United Aircraft and general manager of Chance Vought Aircraft Division, has been appointed general assistant to the president of United Aircraft, in addition to his other offices.

*H. M. Richardson*, engineer, General Electric Plastics Department, Pittsfield, Mass., spoke on the manufacture of molded plastics before a group of trade and business paper editors

**H. M. Richardson**
*Talks on Plastics*

visiting Pittsfield, Dec. 2 and 3, to inspect the recently opened molding plant of the General Electric Co.

*Thomas Midgley, Jr.*, vice-president, Ethyl Gasoline Corp., addressed the Houston, Tex., Chamber of Commerce at its Dec. 9 meeting.

*Russell Pyles* has joined Clark Bros. Co., Olean, N. Y., as Diesel development engineer. He formerly held a similar position with Chicago Pneumatic Tool Co., Franklin, Pa.

*Charles J. McCarthy*, who has been engineering manager, Chance Vought Aircraft Division, United Aircraft Corp., has been named assistant general manager of the division.

*Charles Maynard Parsons* has been named Pontiac zone service manager with headquarters in Albany, N. Y. He was previously Pontiac service representative in Philadelphia.

*Curtis L. Bates*, formerly assistant chief engineer, Timm Aircraft Corp., Glendale, Calif., has joined Northrop Division, Douglas Aircraft Corp., Los Angeles, as stress engineer.

*James D. Mooney*, president, General Motors Export Co., returned to the United States early last month following a six-weeks' trip through the countries of central Europe.

**H. C. M. Stevens**
*General Manager*

*H. C. M. Stevens* is general manager of Avimo, Ltd., Taunton, England. Until taking this office he was consulting engineer in Paris, France.

*Frederick C. Brandt* has joined the Ingersoll Steel & Disc Co., Chicago, as production engineer. He was formerly tool engineer, pump department, Hydraulic Pump Division, Sundstrand Machine Tool Co., Rockford, Ill.

*F. K. Glynn*, chairman of the SAE Sections Committee, and *S. G. Tilden*, Metropolitan Section chairman, addressed a group of engineering students at the Newark (N.J.) College of Engineering, Dec. 6.

*R. H. Brouck*, fleet representative, E. I. du Pont de Nemours & Co., Chicago, recently addressed a group of engineering students at Notre Dame University.

*Kanenori Nomaguchi* recently joined the Tokyo Motor Vehicle Industry Co., Ltd., Tokyo, Japan, as designer. He was formerly with the Tokyo Gas and Electric Engineering Co., Ltd.

*Otto Mueller* has been placed in charge of engineering, frame division of Murray Corp. of America, Detroit. He was formerly consulting engineer, Mueller Engineering, Dearborn, Mich.

*Walter J. Spiro*, formerly treasurer and general manager, C. Spiro Manufacturing Co., Dobbs Ferry, N. Y., has established an office as consulting engineer at 37 West 43rd St., New York City.

*Albert Lodge* is proprietor of Goodrich Oil Sales Co., Greenfield, Mass. Prior to Dec. 1, he was district agent for Goodrich Oil Products, Inc., at the same address.

**R. F. Steeneck**
*To Cleveland*

*Robert F. Steeneck* has been made manager of the Cleveland office of the Fafnir Bearing Co. Before this promotion he was development engineer for the same company, located in Detroit.

*Joseph Geschelin*, Detroit technical editor, *Automotive Industries*, spoke at the Dec. 13 meeting of the Detroit chapter of the Society for the Advancement of Management.

*W. Rex Brashear* has been appointed special representative, Lincoln Zephyr sales, by the MacCarthy Motor Co., St. Louis.

*Yoshio Ogawa* is in charge of the engineering department of Nissan Jidosha Sales Co., Ltd., Tokyo, Japan. He was previously automotive engineer and technical supervisor.

*William H. Bushkin* has been promoted from district service manager, San Francisco, to regional service merchandising manager, Los Angeles, by the Chrysler Corp.

**A. E. Ulmann**
*Flies Over Europe*

*A. E. Ulmann*, vice-president, Aviation Equipment and Export, Inc., recently returned from a complete European tour, flying a Cessna-Warner four-place cabin plane. He made a previous trip covering Central Europe and the Balkans in a Porterfield 70, and expects to make a similar trip next month in a new C38 Cessna. Mr. Ulmann commutes by air from Port Washington, L. I., to New York.

*Dr. H. C. Dickinson*, chairman of the Highway Research Board of the National Research Council, presided at its 17th annual meeting, Nov. 30 to Dec. 3, Washington, D. C. *William B. Stout*, president, Stout Engineering Laboratories, was speaker at the Highway Research Dinner, Dec. 2.

*Dr. Miller McClintock* is described as "the man who has made traffic a career . . . whose concern is for the safety of millions of motorists" in an article by Thomas Sugrue revealing his methods, aims and plans for the future, appearing in the December issue of *Scribner's Magazine*.

*Morley Sanford Easton* has joined the engine and experimental division, engineering department, Chrysler Corp. of Canada, Windsor. He was previously superintendent of the engineering experimental department, General Motors of Canada, Ltd., Oshawa.

## On A.S.M.E. Program

When the American Society of Mechanical Engineers held its 58th Annual Meeting in New York, Dec. 6-10, the following SAE members were authors of papers presented at its sessions: James H. Herron, A.S.M.E. president, who read the presidential address; E. J. Abbott, J. W. Anderson, W. S. Bowen, F. H. Dutcher, Alexander Klemin, S. A. McKee, and F. P. Zimmerli.

## *W. L. Reinhardt*

W. L. Reinhardt, chief engineer of Willard Storage Battery Co. for many years, died recently. After serving as superintendent of Auburn Township Schools in Ohio, he joined Willard as a chemist in 1918. Soon afterwards he was named supervisor of research, chemical, production, control and experimental laboratories. He was promoted to chief engineer in 1929.

Mr. Reinhardt, who was 46 years old, was educated at the College of Wooster. He became a member of the Society in 1934 and was active on the subdivision on storage battery life tests of the SAE Standards Committee Electrical Equipment Division.

# New Members Qualified

**These applicants who have qualified for admission to the Society have been welcomed into membership between Nov. 15, 1937, and Dec. 15, 1937.**

**The various grades of membership are indicated by: (M) Member; (A) Associate Member; (J) Junior; (Aff.) Affiliate Member; (SM) Service Member; (FM) Foreign Member.**

ALLEN, ELEANOR (Miss) (J) detailer, airplane wheel and brake division, Bendix Products Corp., South Bend, Ind. (mail) 1310 W. Jefferson Blvd.

BALLUDER, ERWIN (A) manager, western division, Pan American Airways, Box 1311, Brownsville, Texas.

BERGMANN, THOMAS FAY (J) test engineer, Wright Aeronautical Corp., Paterson, N. J. (mail) 128 Ward St.

BERTHOLET, B. E. (A) sales engineer, Allen Electric & Equipment Co., Kalamazoo, Mich. (mail) 290 Union Ave., Irvington, N. J.

BOWMAN, RICHARD G. (M) aeronautical engineer, Seversky Aircraft Corp., Farmingdale, L. I., N. Y. (mail) 92-05 Whitney Ave., Elmhurst, L. I., N. Y.

BURGESS, ARCHIE R. (J) instructor, Washington University, Skinker & Lindell, St. Louis, Mo.

BURNS, WALTER E. (A) president, W. E. Burns – Dan Burns, 138 N.W. Davis St., Portland, Ore. (mail) 2566 S.W. Vista Ave.

CALEEN, REYNOLD L. (J) flight engineer, United Air Lines Transport Corp., 5936 S. Cicero St., Chicago, Ill.

CAMPBELL, JOHN M. (M) research engineer, General Motors Corp., 11-172 General Motors Research Laboratory, Detroit, Mich.

CARLSON, RAYMOND M. (J) chief engineer, Taylor-Young Airplane Co., Alliance, Ohio.

CHAMBERLAIN, HAROLD (A) Manufacturers Sales Dept., Goodyear Tire & Rubber Co. of Canada, Ltd., New Toronto, Ontario, Canada.

CRAWFORD, KARL B. (M) assistant to president, American Coach & Body Co., 9503 Woodland Ave., Cleveland, Ohio.

DEDO, HOMER H. (M) engineer, Ethyl Gasoline Corp., 723 E. Milwaukee Ave., Detroit, Mich.

DOUGLAS, LEON L. (J) engineer, Seversky Aircraft Corp., Farmingdale, L. I., N. Y. (mail) 2155 76th St., Brooklyn, N. Y.

DRAYTON, WILLIAM B. (J) mechanic, McLaughlin Motors, Inc., 91 South Ave., Whitman, Mass. (mail) 258 Holbrook Rd., Quincy, Mass.

FENN, EDWARD H. (M) project engineer, Pratt & Whitney Aircraft Division of United Aircraft Corp., East Hartford, Conn. (mail) 51 S. Highland St., West Hartford, Conn.

FENSTEMAKER, JAMES FRANKLIN (A) lubricating sales engineer, Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City. (mail) Post Office Box 25, Plainfield, N. J.

FRICHOT, BERT C. (M) chief chemist, Deep Rock Oil Corp., Box 1031, Cushing, Okla.

FRISCH, LAWRENCE V. (J) automotive engineer, Shell Oil Co., Shell Bldg., San Francisco, Calif.

GRUSH, MARVIN DWIGHT (A) auto mechanic, United States Marine Corps, San Francisco, Calif. (mail) 100 Harrison St.

GUIOU, ELTY C. (M) motor vehicle supervisor, New England Telephone & Telegraph Co., Room 1016, 50 Oliver St., Boston, Mass.

HANSCOM, RUSSELL COLDWELL (J) motor check engineer, Associated Oil Co., 610 S. Main St., Los Angeles, Calif. (mail) 706 S. Vermont Ave.

HARGER, GEORGE HOWARD (A) manager, lubrication sales, Northern California Div., General Petroleum Corp. of Calif., 417 Montgomery St.

HARVEY, H. B. (M) president, Harvey Metal Corp., 74th & Ashland Ave., Chicago, Ill.

HETZEL, THEODORE BRINTON (M) instructor, Haverford College, Haverford, Pa.

HICKEY, JOHN H. (A) general service manager, Chrysler Corp. of Canada, Ltd., Windsor, Ontario, Canada. (mail) 266 Rossini Blvd.

HILL, PETER LIONEL HEYLIGER (J) workshop officer, Royal Indian Army Service Corps, Heavy Repair Shops, Quetta, Baluchistan, India.

HOTTINGER, EMIL (M) engineer, Bearings Co. of America, Lancaster, Pa.

HOWELL, CARLTON E. (M) sponsor engineer, Ebasco Services, Inc., 2 Rector St., New York City.

HUXTABLE, RICHARD S. (J) production department, Winton Engine Mfg. Corp., Cleveland, Ohio. (mail) 1106 Forest Road, Lakewood, Ohio.

JOHNSON, JAMES H., Lieut. Col. (SM) chief, Motor Transport Branch, U. S. Army, Office Quartermaster General, Room 2018 Munitions Bldg., Washington, D. C.

JOHNSON, RALPH R. (M) industrial co-ordinator, College of Engrg., University of Detroit, McNichols Road at Livernois, Detroit, Mich.

JOHNSON, RUSSELL HAROLD (M) engine design, Yellow Truck & Coach Mfg. Co., Pontiac, Mich. (mail) 663 Purdy St., Birmingham, Mich.

KEMMER, PAUL H., Capt. (SM) assistant chief, Aircraft Branch, U. S. Army Air Corps, Materiel Div., Wright Field, Dayton, Ohio.

KETCHAM, ROBERT THOMPSON (J) apprentice engineer, Caterpillar Tractor Co., Peoria, Ill. (mail) 203 N. Glenwood Ave.

KING, LESLIE WILLIAM (FM) technical representative, Clayton Dewandre Co., Ltd., Titanic Works, Lincoln, England. (mail) 71 Wensley Drive, Leeds 7, England.

KURTZ, L. G. (M) Deputy Commissioner, City of New York, Dept. of Sanitation, 125 Worth St., New York City.

LAND, NORMAN STAFFORD (J) graduate student, University of Michigan, Ann Arbor, Mich. (mail) 506 E. Jefferson St.

LESLIE, ARTHUR, Lieut. (FM) works manager, Royal Indian Army Service Corps, Officers Mess, Bannu, N.W.F.P., India.

LIEBER, FRANCIS (A) inspector, Aero Insurance Underwriters, 156 William St., New York City. (mail) Walton Road, Blue Bell, Pa.

LIMBERG, ALFONS A. (M) supervisor, Fisher Body Co., Engine Dept., General Motors Research Bldg. B, Detroit, Mich.

LITTLE, WILLIAM F. (M) engineer, Electrical Testing Laboratories, 540 E. 80th St., New York City.

## About Authors

(*Continued from page* 11)

***Committee and, for the past two years, the National Sections Committee. Since 1934 he has represented the SAE on the Motor Vehicle Conference Committee. Mr. Glynn received his M. E. degree from Syracuse University. He joined the Bell System in 1919 and was named engineer of motor-vehicles in the New York Telephone Co. in 1923. Three years later he took his present position as engineer, operation and maintenance of automotive equipment, American Telephone & Telegraph Co.***

● **William G. Harvey** ***started the first plant in this country for the manufacture of magnesium from the oxide and chloride, based upon his investigation of the electrolytes suitable for this method of production. Upon graduating from the University of Michigan in 1908 with a degree of B. S. in chemical engineering, he became interested in experimental production of electrolytic iron and from this, entered the electrolytic caustic soda and chlorine industry. He then turned to the magnesium field. In the years that followed he directed research on electrolytic methods for producing calcium, barium, cerium, and beryllium. His later years have been devoted to the improvement of light weight magnesium alloys and to the expansion of industrial uses thereof. He was recently elected to the presidency of the Electro-chemical Society.***

● **R. B. Haynes'** ***experience in the automotive industry includes two years in Russia (1930-1931) engaged in setting up a plant in Moscow for the production of automotive electrical equipment. His first contact with the industry was in 1916 when he joined Packard as tool designer in the automatic screw machine division. During the next seven years he widened his tooling experience in the employ of such firms as Timken-Detroit Axle, Studebaker and Cadillac. With this background he joined the Electric Auto-Lite Co. as methods engineer, ignition division, advancing to works manager of that division in 1929. The next two years he spent in Russia. Since his return he has been master mechanic for the Spicer Manufacturing Corp., Toledo.***

● **Howard J. Heath** ***has specialized in the development of foundry practice and casting alloys since joining the staff of the technical direction division of the Aluminum Co. of America in 1929. Until his recent transfer to the new Los Angeles plant of the West Coast Foundry Division of the company, Mr. Heath was located in Cleveland. He received his B. S. degree in chemical engineering from Purdue University. Before joining the Aluminum Company he was assistant chemist and metallurgist with the Chrysler Corp.***

● **T. B. Rendel** ***was 1936 vice-president of the SAE representing its Fuels and Lubricants Activity. Born in England, he came to the United States in 1927 and is now in charge of the Shell Petroleum Corp. automotive laboratories at Wood River, Ill. He has contributed extensively to the Society's fuel research work and is chairman of the Volunteer Group for Compression-Ignition Fuel Research. His engineering degree came from Clare College, Cambridge University. He also attended the Royal Naval College at Dartmouth.***

● **Kent R. Van Horn** ***has been a member of the Cleveland division of the Aluminum Research Laboratories since 1929, engaged in the study of foundry control of castings and the internal or crystal structure of aluminum alloys. A considerable portion of his research has been devoted to the development and testing of aircraft castings. Dr. Van Horn is author of many technical papers on the X-ray structure of both non-ferrous and ferrous alloys. He graduated from Case in 1926 and later received his Ph. D. in metallurgy from Yale University.***

MacNaughton, Ernest J. (J) detailer, Packard Motor Car Co., Detroit, Mich. (mail) 1010 Chalmers, Apt. 306.

Meyer, Henry C. (A) fleet sales supervisor, Milwaukee Avenue Motor Sales, 2504 Milwaukee Ave., Chicago, Ill.

Minke, Ralph A. (M) sales engineer, Equipment Div., Thompson Products, Inc., 7881 Conant Ave., Detroit, Mich.

Moody, Arthur M. G. (J) instructor, University of Delaware, Evans Hall, Newark, Del.

Morris, Donald William (J) experimental engineer, Twin Disc Clutch Co., Racine, Wis. (mail) 1600 S. Main St.

Moxey, John G., Jr., (J) laboratory assistant, Sun Oil Co., Marcus Hook, Pa. (mail) 404 Elm Ave., Swarthmore, Pa.

Murrell-Wright, John Frederick (J) Production Div., General Motors Near East S/A, Post Office Bag, Alexandria, Egypt.

Nagle, Theo. H. (A) director, service engineering, United Motors Service, Inc., 3044 E. Grand Blvd., Detroit, Mich.

Nelson, Jack A. (J) automotive engineer, Standard Oil Co. of Ind., Equitable Life Bldg., Des Moines, Iowa. (mail) 4045 Third St.

Nicholas, Donald Y. (J) promotional manager, D. G. Nicholas Co., 533 Wyoming Ave., Scranton, Pa. (mail) 113 S. Bromley Ave.

Nicol, William Franklin (J) draftsman, Braniff Airways, Inc., Love Field, Dallas, Texas.

Nulle, J. Howard (J) process inspector, Hyatt Roller Bearing Co., Harrison, N. J. (mail) 1185 Park Ave., New York City.

Palmgren, Gunnar (M) chief engineer, S K F Industries, Inc., Front St. & Erie Ave., Philadelphia, Pa.

Panhandle Refining Co. (Aff.) Post Office Box 1191, Wichita Falls, Texas. Rep: Sims, Willis F., refinery manager.

Paxton, Charles N. (J) associate professor, University of Oklahoma, School of Mechanical Engrg., Norman, Okla.

Pobjoy, Douglas Rudolf (FM) chairman, managing director, chief engineer, Pobjoy Airmotors & Aircraft, Ltd., Rochester, England.

Reyna, Carl Alan (A) superintendent of maintenance, Bell-Brook Dairies, Inc., 1198 Howard St., San Francisco, Calif. (mail) 226 Santa Rosa Ave.

Reznek, Louis (J) junior mechanical engineer, Interstate Commerce Commission, Bureau of Motor Carriers, Section of Safety, 12th & Constitution Ave., Washington, D. C. (mail) 310 Gallatin St., N.W.

Roeber, Ernest M. (J) draftsman, Godfrey Mfg. Co., Box 284, New Brunswick, N. J. (mail) 196-15 42nd Road, Flushing, L. I., N. Y.

Ross, Donald W. (M) transportation engineer, Geophysical Service, Inc., 1311 Republic Bank Bldg., Dallas, Texas.

Saxton, William Earle (M) engineer, Standard Steel Spring Co., Fourth Ave., Coraopolis, Pa.

Scott, E. E. (M) superintendent, motor equipment, City of Oklahoma Municipal Garage, Oklahoma City, Okla. (mail) 1910 N. W. Eighth St.

Sherman, L. L. (M) traffic supervisor, Iowa-Nebraska Light & Power Co., Lincoln, Neb. (mail) 3124 N St.

Simmons, Frank R. (A) service manager, General Motors Truck & Coach Co., 23rd & Carpenter Sts., Philadelphia, Pa. (mail) 5937 Washington Ave.

Smith, Yeatman W. (A) automotive engineer, Sinclair Refining Co., 2540 W. Cermak Road, Chicago, Ill. (mail) 1761 Waterman Ave., Detroit, Mich.

Todd, Harold A. (A) president, general manager, Wisconsin Motor Corp., 1910 S. 53rd St., Milwaukee, Wis.

Whitfield, Randolph (J) supervisor, automotive equipment, Georgia Power Co., Atlanta, Ga.

Witchger, Eugene S. (J) engineer, Eaton Mfg. Co., 9771 French Road, Detroit, Mich.

Woolson, L. Irving (M) chief engineer, Chrysler Corp., DeSoto Div., Wyoming & McGraw Aves., Detroit, Mich.

Wright, Earl E. (A) motor truck sales, International Harvester Co., Denver, Colo. (mail) 4905 E. 22nd Ave.

# Applications Received

**The applications for membership received between Nov. 15, 1937, and Dec. 15, 1937, are listed herewith. The members of the Society are urged to send any pertinent information with regard to those listed which the Council should have for consideration prior to their election. It is requested that such communications from members be sent promptly.**

Antheil, Robert E., engineer, Thermoid Co., Trenton, N. J.

Applegate, George A., chief Diesel instructor, National Schools, Los Angeles, Calif.

Baier, Jacob, shop foreman, Sherwood Bros., Inc., Baltimore, Md.

Bamford, Joss, technical adviser, War Office, London, England.

Begg, Ross Hunter, Jr., test engineer, Pratt & Whitney Aircraft, E. Hartford, Conn.

Benbow, L. L., instructor, National Schools, Los Angeles, Calif.

Bowser, Raymond R., partner and manager, Bowser-Morner Testing Laboratories, Dayton, O.

Bryant, Richard U., development department, Firestone Tire & Rubber Co., Akron, O.

Burkhard, Harry, sales manager, White Motor Co., Newark, N. J.

Carl, James W., superintendent, Simonds Worden White Co., Dayton, O.

Chandler, Walter G. D., representative, McQuay Norris Mfg. Co. of Canada, Ltd., Toronto, Ont., Canada.

Cheriez, Charles Y., body draftsman, Hudson Motor Car Co., Detroit, Mich.

Chrysler, Jack Forker, clerk, New Process Gear Corp., Syracuse, N. Y.

Clapp, M. Roge, assistant, Purdue University, W. Lafayette, Ind.

Clewell, Frank B., assistant chief engineer, Godfrey Mfg. Corp., New Brunswick, N. J.

Cloutier, Ellery J., chief body engineer, Graham-Paige Motors Corp., Detroit, Mich.

Coles, Ralph John, instructor, National Schools, Los Angeles, Calif.

Columbus Metal Products, Inc., Columbus, O.

Dyer, H. M., commercial salesman, General Petroleum Corp., Los Angeles, Calif.

Engstrom, John E., student engineer, Chrysler Corp., Highland Park, Mich.

Evans, John H., chief engineer, Rollway Bearing Co., Inc., Syracuse, N. Y.

Eyolfson, Paul, order clerk, Pacific Metal Co., Portland, Oregon.

Ford, A. R., general manager, Frost Gear & Forge, Division of Clark Equipment Co., Jackson, Mich.

Gilpin, Harold P., Jr., 15 Suffolk Ave., Maplewood, N. J.

Gossage, G. Murray, sales, Aluminum Co. of Canada, Ltd., Toronto, Ont., Canada.

Greenhouse, Clifford, lubrication sales, Macmillan Petroleum Corp., Los Angeles, Calif.

Gustafson, Floyd Carl, engineer, Chandler-Groves Co., Detroit, Mich.

Hanson, Paul R., division manager, Dunlop Tire & Rubber Co., Ltd., Montreal, Que., Canada.

Hartman, George LeRoy, draftsman, Superior Body Co., Lima, Ohio.

Hawley, Wellington M., paint superintendent, Fisher Body Corp., Detroit, Mich.

Henry, Robert H., assistant division manager, Simonds Worden White Co., Dayton, O.

Herlihy, John A., director engineering, United Air Lines Transport Corp., Chicago, Ill.

Hewitt, Charles H., president, Dayton Forging & Heat Treating Co., Dayton, O.

Ingersoll, A. A., president, Mullen & Ingersoll Garage Co., Denver, Colo.

Johnson, J. William, engineer, maintenance, U. S. Dept. of Agriculture, Fennimore, Wis.

Kline, Jack Edward, automotive engineer, Standard Oil Co., Whiting, Ind.

Kruczek, Anthony S., physical test laboratory assistant, Buffalo, N. Y.

Lampton, G. T., project engineer, Aviation Mfg. Corp., Williamsport, Pa.

L'Allemand, George W., Jr., design engineer, Hegeman-MacCormack Corp., New York City.

Lewis, Oliver Griffith, research engineer, Standard Oil Development Co., Elizabeth, N. J.

Lowe, William F., secretary-treasurer, Natural Gasoline Association of America, Tulsa, Okla.

Lyden, J. L., maintenance, Phillips Bros. Coal Co., Formont, Pittsburgh, Pa.

Lyden, J. Wilbur, United Motors Service, Berwyn, Ill.

McCann, John H., branch manager, Crane Co., Detroit, Mich.

Miller, Frank J., manager, New Departure Co., Chicago, Ill.

Moyer, George Oliver, instructor, National Schools, Los Angeles, Calif.

Mueller, Carl H., sales engineer, Lincoln Engineering Co., Detroit, Mich.

Peck, David Cameron, assistant to president, Bowman Dairy Co., Chicago, Ill.

Pepperman, Carl W., development engineer, Lewis Engineering Co., Naugatuck, Conn.

Porter, Charles F., engineer, Chrysler Motor Car Corp., Detroit, Mich.

Prichard, Evan, engineer, Tricoach Corp., Seattle, Wash.

Ragsdale, LaVerne B., draftsman, Hudson Motor Car Co., Detroit, Mich.

Sandow, Abe, secretary, U. S. Hammered Piston Ring Co., Inc., Stirling, N. J.

Schofield, Felix Bowker, draftsman, Messrs. English Racing Automobiles, Ltd., Bourne, Lincolnshire, England.

Sisman, Eric Wilson, research engineer, British Belting & Asbestos, Scandinavia Mills, Cleckheaton, Yorks, England.

Spicer, Arthur Travers, Sherwood Bros., Inc., Baltimore, Md.

Stork, Wilford L., assistant professor, College of City of New York, New York City.

Sundberg, Gustave L., engineer, Muskegon Piston Ring Co., Muskegon, Mich.

Taylor, Harry Newton, Standard Oil Co. (Ind.) Whiting, Ind.

Taylor, William W., assistant general manager, Prest-O-Lite Storage Battery Co., Ltd., Toronto, Ont., Canada.

Vail, Robert P., instructor, Texas Technological College, Lubbock, Texas.

Vogt, Robert F., chief consulting engineer, Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Wenzel, Albert A., vice-president and treasurer, U. S. Hammered Piston Ring, Inc., Stirling, N. J.

Westlake, Henry, research engineer, Westlake & Taylor, Ltd., Kingston, England.

Wightman, Harold W., superintendent, auto maintenance, Public Service Electric & Gas Co., Newark, N. J.

Yoder, William Henry, paint engineer supervisor, Fisher Body Corp., Detroit, Mich.

# News of the Society

(*Continued from page 24*)

space for the engine, he explained, adding, but there is no room in the cab in which to kick a football around. However, he pointed out, when making store-door deliveries the driver spends such a small portion of his time in the cab that a reversion to earlier standards of driver comfort is working well in practice.

A gain of 18 in. in the length of the payload means an increase of 60 cu. ft. or so in hauling capacity, enough to change an otherwise unprofitable contract into a profit-maker, he explained. On some cab-astride trucks the space saved by moving the cab forward has been used to shorten the wheelbase to obtain better weight distribution for bodies on trucks which operate where space is at a premium, he reported.

Discussion was conducted by Section Chairman Ralph Baggaley, Jr., of McCrady-Rodgers, who pointed out that from the practical viewpoint of the fleet operator, an overload carried for a short distance and at low speeds, decreasing to a lighter load during the rest of the trip, might easily result in the difference between operating at a profit, or at a loss. He also said that during a short haul, as from a freight station to the first stop, perhaps a half-mile away, the tires and the engine would not be apt to become overheated.

John Orr, of Equitable Auto, described the experiences of his company with a C.O.E. tractor for hauling poles of 40 to 60 ft. in length, and mentioned the advantages of greater visibility due to the higher position of the driver. Other prominent discussers included B. H. Eaton, Bell Telephone Co.; George W. Brisbin, Peoples-Columbia Gas; Stephen Johnson, Jr., Bendix-Westinghouse; Harry Badger, Autocar; and Les Carlson, Gulf Refining.

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The Mellon Institute of Industrial Research was host to members of the Pittsburgh Section on an inspection trip through its new building, Dec. 14. Dr. Lawrence W. Bass, assistant director, explained the purposes of the Institute and the relation of its work to that of the automotive industry. The members were conducted through the building in small groups by guides who explained the operations of most interest to men in the automotive field.

A dinner at Webster Hall preceded the meeting and was attended by 165, while later arrivals increased the total attendance to 190. At the speaker's table, Chairman Ralph Baggaley, Jr., introduced SAE President Harry T. Woolson and General Manager John A. C. Warner, who gave interesting talks on the purposes of the SAE.

Hosts at the Mellon Institute, Dr. Bass and Dr. W. A. Gruse, in charge of petroleum research, were introduced at the same time, and also Charles R. Noll, of Gulf Oil Corp., who conceived the idea of this meeting when he was chairman of the Pittsburgh Section five years ago, and completed the arrangements for the present meeting.

## Record Crowd Hears President Woolson Speak

**● Canadian**

Setting a December meeting record, more than 100 members and guests of the Canadian Section gathered at the Royal York Hotel, Toronto, to welcome SAE President Harry T. Woolson on his visit to the Section. Introduced by Chairman W. E. McGraw, Mr. Woolson spoke on "A Long Range View of Automotive Engineering."

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*At the meeting a turkey draw was held netting approximately $60 for the Neighborhood Workers' Christmas-basket fund.*

## Diesel Maintenance Problems Analyzed

**● Oregon**

The Oregon Section concentrated on Diesel maintenance at its Dec. 10 meeting held at the Imperial Hotel, Portland. John Bennett of the Cummings Diesel Co., covered the subject, taking as a base of his talk the paper prepared by Mr. J. L. S. Snead, Jr., of the Consolidated Freight Lines.

After presenting the paper Mr. Bennett spoke at some length analyzing Diesel maintenance problems, bringing out in particular the importance of reving up the Diesel engine to the speed at which it is designed to operate, accenting the fact that lugging or operating at lower speeds causes incomplete combustion, excessive cylinder wear, bearing failures, excessive deposits of carbon and sludge, and loss of power.

J. Verne Savage gave a detailed account of the recent T. & M. meeting in San Francisco, discussing the highlights of each of the papers presented at that meeting.

## Road Saturation Point Said Reached in 1924

**● Baltimore**

"Automobile accidents are intimate forms of congestion" according to the definition set forth by Wallace L. Braun, traffic engineer, Baltimore Police Department, at the Dec. 2 meeting of the Baltimore Section. Mr. Braun was one of two speakers presenting papers on "Technical Progress in Safety Promotion." He spoke particularly on city streets, and Clarence P. Taylor, Maryland Highway Planning Survey, discussed rural highways.

Mr. Braun set 1924 as the date existing roads became saturated with motor-vehicles and as the beginning of traffic engineering, or the technical approach to the solution of the traffic problem.

After outlining the application of such traffic remedies as signs, markings on pavement, and traffic control signals, he discussed the merit of one-way streets in providing greater street capacity and increased safety. Experience has shown, he said, that two one-way streets accommodate from 30 to 50 per cent more traffic than two two-way streets and that the number of accidents is reduced.

Both Mr. Braun and Mr. Taylor spoke particularly of the beneficial work done by the American Association of State Highway Officials and the National Conference on Street and Highway Safety in jointly preparing the "Manual on Uniform Traffic Control Devices for Streets and Highways," although both agree that it will probably take a good many years to obtain complete standardization. The reason, as stated by Mr. Braun, is that all the money made available for traffic control purposes is in most instances insufficient to defray the expense of much needed additional devices and very little is set aside for the replacement of existing equipment.

Mr. Taylor stressed the fact that we are now suffering because of lack of vision in design of past roads. Highway departments, he said, are trying earnestly to make these old roads safer and to build their new highways so that they will be adequate and safe for a long time to come. Forty-four states, he noted, are now engaged in making highway planning surveys in cooperation with the United States Bureau of Public Roads. When these are completed, he added, they will be valuable in helping highway engineers design and build roads for the future.

He told of the usual steps in making the "inherited roads" more safe for travel by means of placing warning signs, building shoulders, straightening curves, eliminating grade crossings and improving sight distances, but stated that it is in the construction of new trunk-line highways, however, that technical progress made in safety shows up best.

In concluding Mr. Taylor remarked, "The solution of the traffic accident problem is illustrated by the story of the bundle of sticks; wherein it was made clear that although the bundle could not be broken as a whole the same result could be achieved by breaking individual sticks. So it is with accidents. No single idea, method or procedure has produced a noticeable break in the rural accident situation. Yet, by overcoming each of the many difficulties separately, we will find eventually that we have solved the whole problem."

## Meeting Place Moved To Accommodate Crowd

**● Indiana**

So many members and guests of the Indiana Section came to hear H. M. Webber of General Electric Co. talk on "Brazing Materials in Controlled Atmosphere Electric Furnaces," at Anderson, Dec. 9, that the meeting had to be moved from the Anderson Hotel, where dinner was served, to the near-by Longfellow School auditorium. Nearly 200 braved an icy gale to attend.

Illustrating his talk with slides and actual specimens of electric-furnace brazing, Mr. Webber told of the constantly increasing use of this process by companies in the automotive industry. The growing use of electric-furnace brazing, he declared, can be traced to the added durability of parts joined by this process over those joined by older methods, the simplicity of the process, and lower cost.

Discussion period brought questions from the floor regarding the practicability of brazing special types of metals, indicating the interest of engineers and production men in the use of controlled atmosphere electric furnaces for brazing.

## Nash Engineer Talks on Iso-Thermal Manifold

**● Milwaukee**

The December meeting of the Milwaukee Section was a triple-feature event. Guests of the Nash-Kelvinator Corp. at its Kenosha plant, a record number of members first, inspected the plant; second, enjoyed dinner at the Kenosha Elks Club; and third, heard Earl Monson speak on advantages of the iso-thermal manifold and the conditioned-air unit used on Nash cars.

In discussing the iso-thermal manifold, Mr. Monson, who is field engineer for Nash-Kelvinator, said that in the early days high grade gasoline with its good vaporization made manifolding comparatively easy. Increased demand for fuel, however, resulted in poorer grades, which required the addition of heat to the manifold, he added. This tendency continued,

## AT NOVEMBER CHICAGO MEETING

*Bennett of Photo-Chek Service*

**Section Chairman Harry F. Bryan and Norman G. Shidle, speaker, chat at dinner before the meeting starts.**

**W. H. Hubner, W. A. Parrish and Fred L. Faulkner were in attendance.**

he stated, until a great deal of heat was required increasing difficulty of proper control, which was generally manual. Stating that very few operators properly adjusted the control and that the result was mostly unsatisfactory, Mr. Monson explained that in time improvement in fuels plus thermostats helped this condition and that the advent of the down draft carburetor was another marked advancement. Heat control with the down draft carburetor was still a problem, he noted, especially after long hard operation, when the engines were shut off hot and hard starting was encountered.

Considerable research showed that an inlet manifold temperature between 140 and 160 deg. fahr. gave the best performance, especially if the manifold was at a uniform temperature throughout, he said. To get such conditions, the inlet manifold was built into the cylinder block, so that the water jacket could keep the temperature in the proper range. In this connection, Mr. Monson stated that the full advantage of the built-in manifold is only obtained when used with the down draft carburetor. Further improvement resulted in the use of a four-port manifold for a six-cylinder engine in place of three-port, he said.

Mr. Monson showed performance curves for various engines using the iso-thermal manifold. Fuel consumption was 0.55 lb. per b. hp. per hr. over the major portion of the speed range. Curves were also shown for an engine with a conventional manifold and 5.7 to 1 compression ratio and also with an iso-thermal manifold and 6 to 1 compression ratio. In the latter case the output of the engine was up 10 per cent.

For the conditioned-air system, Mr. Monson presented five points:

First, the air is maintained at 70 deg. fahr. regardless of outside temperature. This is possible because plenty of heat is available in the water jacket and an efficient heat exchanger heats the air passing through the unit. A fan is provided for circulation at low car speeds and when the car is stopped. In the latter case the discharge is 100 cu. ft. of air per min. At higher speeds, the fan is not required as the cowl ventilators pick up the air required. At high speeds this is as much as 400 cu. ft. per min.

Second, the air circulation, because of its warmth, eliminates drafts. The car is under positive pressure amounting to approximately one inch of water, hence no drafts can arise from cold air coming in around window panes.

Third, at all times the entering air is filtered and clean. To accomplish this a filter is provided in the conditioned-air unit. While going through the filter the direction of motion is changed several times and fine particles are removed. The air is also centrifuged before going through the filter, which removes large particles. The construction of the air passage is so designed that the entering air swirls itself.

The fourth advantage listed is the elimination of fogging of windows and windshield. Fogging is the result of air moisture condensing on the cold surfaces. Because the conditioned-air is heated the relative humidity of the air is lowered so that no moisture is available for fogging.

Fifth, he mentioned the contribution of conditioned-air to safety. Fresh, clean air under proper conditions prevents drowsiness of the driver.

Meade Moore, chief engineer of Nash Motors, also spoke briefly, emphasizing the necessity of positive pressure within the car as a prevention of drafts. In addition Mr. Moore told of experiments which show that moving air under 85 deg. fahr. causes the sensation of drafts. Above this and below 105 deg. fahr. no such sensation is recorded. Above 105 deg. fahr. the sensation is that of a hot blast. These fundamental experiments, he brought out, are the basis upon which the conditioned-air unit was designed.

## Gives Highlights of Chrysler Test Methods

**● Chicago**

How valuable are laboratory testing methods and equipment for the car maker? Just what do they accomplish in improvement of parts design and performance? And what are the future trends in this field of automotive progress?

Some highly interesting data on these and other aspects of testing methods and equipment were supplied by C. A. Brady of the Chrysler Corp., on Dec. 7, in a slide-illustrated address before the December semi-closed meeting of the Chicago Section and attended by 152 members and invited guests.

Fan belt life, formerly only 12 to 15 hr., when laboratory tests began several years ago by Chrysler engineers, Mr. Brady said, have now been increased to 300 hr. Weld and axle end sections of tubular axles have been increased in fatigue resistance by several hundred per cent, as the result of slight changes found practical by reason of laboratory testing experience.

Dovetailing with field tests going on simultaneously, laboratory testing, Mr. Brady declared, permits accurate control of conditions and the acceleration of tests which will virtually duplicate field conditions and provide results with a saving of time. The Chrysler mechanical laboratory, employing 40 men who follow through on tests both in the laboratory and in the field, has advanced set-up procedure and testing technique, the speaker pointed out, to the point where steady improvement in parts characteristics and qualities have been shown. Development of equipment is illustrated by the propeller shaft balance checking machine. Originally consisting of a temporary set-up on a mechanic's work bench, it has been improved and rebuilt a number of times over a period of 10 years until it is now a very accurate and highly specialized piece of equipment.

The oil-filter tests and brake-hose expansion tests are typical of the performance checking equipment, he said. Equipment for the oil-filter tests provide for checking four oil filters simultaneously. From the wear data tests, curves are plotted to show the performance life of each unit's filtering element. Results of tests then govern filter selections and recommendations.

For hydraulic-brake-hose expansion test, the set-up employed is operated with compressed air lines, Mr. Brady explained. Checks are taken of pressures up to 1500 lb. per sq. in. Hose to pass tests must have an expansion in excess of 0.75 c.c. at 1000 lb. per sq. in. and 0.9 c.c. at 1500 lb. per sq. in. As the result of these tests, conducted over a 9-year period, total reduction in expansion of hose has been reduced to approximately 33 per cent at 1000 lb. per sq. in. pressure. This has brought about an increase in the pedal ratio, thus providing a lighter pedal pressure.

Illustrating the endurance testing machine group the author told of a machine for testing propeller shaft life; a set-up with intermittent loading applied by compressed air at pressures to duplicate car operating conditions. The principle of intermittent loading is considered most important, he pointed out, as very few car parts are operated continuously in service at fixed loads and speeds.

For testing axles, a semi-permanent set-up is devised which employs an out-of-balance weight mounted on the brake drum, he said, adding that the test is conducted to produce failure in approximately 20 hr. A set-up for testing fatigue resistance of weld and axle ends of tubular axles disclosed the need for several slight design changes, which when made increased the average life of such parts several hundred per cent, the speaker declared.

Ball-bearing life is tested in a special set-up which, the author states, permits testing of 24 bearings at once. Radial loads are applied by weights acting through a system of compound levers. As 100 per cent overloads are run, the machine greatly speeds up wear and permits earlier decisions on ratings for various makes of bearings. For testing endurance of brake cylinders, pistons and rubber caps, a set-up of eight brake assemblies is employed, using air pressure up to 1500 lb. per sq. in. at the rate of 25 cycles of operation per minute.

Type of checks on production material is exemplified by brake hose flexing test and the fan belt test. The machine for testing hose qualities tests eight samples at one time under pressure conditions much more severe than those of actual service. The set-up for the fan belt testing duplicates car conditions, the belt driving both generator pulley and the fan pulley, but with the fan and water pump load greater than those of actual service. Using a water brake designed to apply a constant load, the test starts at fan speed of 4850 r.p.m. the

belt is adjusted to original tightness and tests continue until failure occurs, the extent of belt stretch being the movement of adjustment screw.

As laboratory testing progresses, the author declared, a wide assortment of electric motors, reduction gears, eccentrics, out of balance weights, bed plates, and other paraphernalia will permit quicker assembly of set-ups for varied purposes. Equipment of a permanent nature will be more elaborate, making more advanced studies possible. More frequent use of finished castings will promote greater cleanliness and better appearance in the modern laboratory. Better testing technique will follow and results will be even more effective then than they are today, Mr. Brady stated.

## Traces Progress of Domestic Refrigerators

**● Dayton**

Precision manufacturing and metallurgical developments have been key factors in increasing the efficiency of domestic refrigerators during the past five years, according to Edward B. Newill, who spoke on "Cold Facts with Tabasco Sauce," before the Dayton Section on Nov. 15.

Mr. Newill, who is assistant general manager, Frigidaire Division of General Motors, pointed out that the main cylinder, the impeller and the divider block are the most important elements involved in compressor efficiency. He explained that the compressor is essentially a slide vane pump and that any appreciable difference in the thickness or parallelism of the above-mentioned elements results in either serious leakage of refrigerant gas or of a binding of the elements in operation. This, he said, is where precision manufacturing comes in, as in present models tolerances are held to three "tenths." He added that the surface trueness and finish of the impeller and divider blocks have been held to such a degree of precision that a stack of parts may be wrung together. As in the case of Johansson blocks, he said, the stack when lifted by its uppermost element hangs together, cohesion overcoming gravity.

He credits the metallurgist for the efficient condenser and evaporator construction which is used by Frigidaire, both of which depend largely on the new copper brazing process using a specially constituted spelter.

The metallurgist, he said, has also taken part in solving a problem that has bothered almost every genial host – removal of ice cubes from the freezer tray. The interior of the tray, he explained, is treated by anodizing the aluminum and sealing its pores with a special hard high-melting-point wax, preventing the adhesion of the ice.

Section Chairman Louis Poock presided at the meeting at which more than fifty were present.

## Wolf Reviews Trends In 1938 Car Design

**● Cleveland**

The most important developments in the 1938 automobiles, said Austin M. Wolf, in addressing the December Cleveland Section Meeting, are the automatic transmission, the coil spring suspension of Buick, the distinctive styling of the Lincoln Zephyr and the Graham, the Cadillac 16 engine, and the turbulator piston of Buick. He spoke also of the policy change in the establishment of optional equipment by General Motors, in making optional the automatic transmissions of Buick and Oldsmobile. The largest crowd of the season was on hand to hear Mr. Wolf.

In a short talk E. F. Lowe, assistant general manager of the Society, told of the excellent employment record of the SAE during the depression, and enumerated the advantages of membership.

*This meeting was designated as "Past-Chairmen's Night" with the result that only two out of the twenty-two past chairmen were not accounted for.*

*James H. Herron as the first chairman of the Cleveland Section was sponsor and told of the trying and critical days from 1912 to 1915.*

## Council Sets Up New SAE Student Committee

With the object of further fostering SAE interest and activity among students of approved engineering institutions, the Council of the Society, at its Dec. 10 meeting, approved the establishment of a new standing committee to be known as the Student Committee. This action was taken upon the recommendation of the Sections Committee and terminates the work of the Student Committee functioning under the general auspices of the Sections Committee.

The new committee will consist of a chairman and four other members; automatically including the chairmen of the Membership and Sections Committees. It will have the responsibility of encouraging student interest in the Society and will maintain close coordination between the student activity and section activity.

## Student-Sponsored Auto Show Attracts 14,000

**● Purdue**

In two nights and a day 14,000 people crowded into the Purdue University Armory to see the third annual auto show sponsored solely by members of the SAE Student Branch at the University.

In contrast to a 1908 model Hupmobile were 55 cars and trucks dated 1938. Drawings by Alex Tremulis of Briggs Body Co., pictured cars of the future. Practically every standard make of car was exhibited and outstanding oil companies and accessory manufacturers had displays. In addition high-speed tanks, tractors and all-wheel drive trucks, furnished by the Marmon-Herrington Co., formed part of an exhibit in which the University's military department displayed modern equipment used by motorized field artillery units.

Every phase of the show, from administration to manual labor, was undertaken by the students. Norman Reinhard, chairman of the Student Branch, headed the show committee. Working with him were officers Jack Vanderford, director of publicity; F. L. Coers, publications; R. A. Gaither, membership; and T. B. Frame, secretary-treasurer. Prof. H. M. Jacklin, faculty adviser, was consultant.

*Early in November 111 seniors from the Purdue University School of Mechanical Engineering visited many of Detroit's automobile plants. At a banquet tendered them by the Detroit Section of the Society in cooperation with the Chrysler Corp., the students heard short addresses by SAE President Harry T. Woolson and Prof. John W. Caton of the Chrysler Institute.*

## Brumbaugh Talks on Axle Engineering

**● Northwest**

Analyzing the principles involved in several tandem-axle hook-ups, A. K. Brumbaugh, Pacific Coast representative, Timken-Detroit Axle Co., explained to members of the Northwest Section, at their November meeting, methods used by different designers in attempting to overcome the problems involved.

Taking "Fundamentals of Axle Engineering" as his subject, the speaker used drawings to illustrate the forces acting on a single axle, namely: bending due to the weight imposed on the axle, bending due to braking and driving torque. He also traced progress made in material research, modern forging methods and new gear cutting machines.

Seventy members and guests of the Northwest Section gathered at Seattle's Mayflower Hotel on the evening of Dec. 11 for the Section's annual dinner-dance. Chairman W. W. Churchill, who presided, introduced the speaker, John G. Holmstrom, chief engineer, Kenworth Motor Truck Corp. Mr. Holmstrom described his recent trip to the Hawaiian Islands.

## New Student Branch At U. of Oklahoma

The University of Oklahoma, known by members of the SAE for its participation in debates which have been high-spots on programs of National Regional Fuels and Lubricants Meetings in the Mid-Continent, will be the home of a new SAE Student Branch. Action establishing the Branch was taken at the Dec. 10 meeting of the Council upon recommendation of Section Committee Chairman Frederick K. Glynn.

A petition signed by 43 students and two members of the faculty requesting the establishment of a Student Branch was the basis for the action.

### Sponsors Luncheon Program

The Southern California Section sponsored the program at the Dec. 16 luncheon of the Los Angeles Joint Engineering Society. A motion picture, "Wings of Progress," was shown by James V. Griffin, director of publicity, Lockheed Aircraft Corp., who remarked on items of interest during the presentation.

## West Coast T&M Meeting

*(Continued from page 23)*

very long through runs by individual buses. These round-trip mileages vary from 1100 to 4500 miles. This means that any of several shops must be prepared to carry out routine maintenance operations on any vehicle putting in an appearance there regardless of where previous service work may have been performed. A system of changing major units of the vehicle is employed, the vehicle being divided into 28 such major units, including carburetor, water pump, transmission, air compressor, engine, shock absorbers, etc.

Not only has the vehicle mile per month been markedly increased but the construction of the buses themselves has undergone such radical changes that current models weigh four tons less than 1930 models and yet seat more passengers. This has required a complete change of body maintenance work which previously required the service primarily of wood workers where today coach bodies are entirely of metal construction.

The final paper of the afternoon concerned "Truck Maintenance Problems" and was read by J. L. S. Snead, Jr., equipment engineer, Consolidated Freight Lines, Portland, Oregon. Mr. Snead's paper turned to heavy duty transport trucks and trailers operating on a route extending from Minneapolis to Seattle.

Brought out forcibly were the operating limitations which experience has proven necessary after observing 25,000,000 miles of operation by 115 Diesel motors, 10 of which have

run in excess of 400,000 miles each. Mr. Snead had little question in his mind that Diesel motors are more sensitive than the gasoline motors used in the past and that they must be operated within a reasonably narrow range of speed and must have the cooling water kept warm.

The setting and maintenance of the fuel injection system are vital to engine life and performance. Therefore, engine manufacturers' standards must be observed and equipment checked at regular intervals. Cold weather operation requires fuel tanks and lines to be designed in such a manner that frozen moisture will not cause engine failures. Similarly, storage tanks which supply fuel to the trucks must be kept free from moisture at regular intervals. Fuel lines of larger diameter than usual are needed and in the very cold weather Diesel fuel, which one ordinarily thinks of as a very thin fluid itself, must be diluted with 10 per cent kerosene to make it flow easily.

Particular attention is paid to safety and all possible precautions are taken to eliminate possibility of accidents.

Discussion from the floor concerned the substituting of Diesel fuel oil itself as the lubricant for the fuel pump governor. This is being used in certain equipment in the West and Mr. Snead contemplates experiments in that direction.

The evening session on Thursday was an informal banquet for 87 persons under the chairmanship of G. L. Neely, research engineer, Standard Oil Co. of Calif. In attendance at the banquet were four past Section chairmen from both the Northern California and Southern California Sections, as well as a number of other long and earnest workers in the Society. Past Northern California Section Chairman E. C. Wood introduced and called upon a number of these veterans for remarks.

Following the dinner a paper entitled "City Planning to Reduce Traffic Congestion" was presented by Leonard V. Newton, vice-president, Market Street Railway Co., San Francisco. Mr. Newton pointed out that the progress of the last 20 years in motor vehicles and other forms of transportation had not been matched by equivalent progress in the design of city streets and traffic arteries despite the fact that the new order of things has resulted in a marked decrease in the number of persons employing street cars as the means of reaching metropolitan centers, and had resulted in a definite upturn in the number of persons entering such areas by motor vehicle.

Many ideas have been advanced as to the solution of this highly complex problem and it cannot be said that the same solution is applicable in all cities. Coordinated planning bodies free from political domination and composed of representatives from a proper cross-section of a city's inhabitants can do much toward curing existing evils and planning properly for the future, Mr. Newton said.

Following Mr. Newton's paper a most interesting discussion from the floor concerned trackless trolleys, merchant resistance to the establishment of one-way streets and a further discussion of the overhead motor highways. Mr. Patton of the Los Angeles Motor Coach Co. told how traffic problems are handled in his city by means of committees such as mentioned in Mr. Newton's paper. Mention was also made of the plan of using four-lane streets on the basis of three lanes inbound and one lane outbound in the morning and the opposite for evening traffic. This has resulted in a material speeding up of traffic in several Los Angeles areas despite the disinclination of many motorists to understand that they should drive between and not over traffic stripes.

The Safety Session on Friday under the chairmanship of C. J. Vogt, associate professor, mechanical engineering, University of California, had a considerable amount of interesting apparatus on exhibit for the purpose of illustrating and demonstrating some of the problems concerning the two papers of the morning.

Leading off was a paper on "Drivers' Tests" by Paul Mason of the California State Department of Motor Vehicles, Sacramento.

In Mr. Mason's opinion, poor judgment, including insufficiently controlled speeds, causes the most accidents. Defective vision is the next major factor.

Regarding the old question of glare, Mr. Mason spoke of the depletion of the chemical in the eye which permits it to resist glare successfully. Continued exposure to strong light, such as California sunshine, effects a reduction in this essential element as does improper diet and old age. The question of side vision or perimeter of vision was discussed and mention made of the variation in a person's range of vision attributable to bodily disorders.

Most interesting were Mr. Mason's remarks regarding drivers having two individually normal eyes, one of which had become lazy or inactive. Normally, a person's eyes should work as a team and if a lazy eye does not transmit an impression to the brain the person is subject to accidents on the side of the deficient eye. It is surprising the extent to which this condition escapes detection because when testing eyes individually and covering the better eye the lazy eye is stimulated into action and may rise to normal very quickly.

Mr. Mason's remarks regarding some of the machines used for drivers' tests indicate that there is much yet to be done in the direction of making the subject feel more at home during the test, especially as regards steering wheel and seat position.

Summing up his remarks, Mr. Mason commented that they had not yet found the perfect driver and that a deficiency does not necessarily make a dangerous driver. It is when the driver ignores his deficiency or is not aware of it that trouble is near at hand. Special forms of limited licenses are used to permit those with known deficiencies to enjoy the benefits of motor vehicles and the low ratio of accidents from such limited licenses proves again that knowledge and intelligence are the final answer.

## West Coast T. & M. Men Meet

**Prof. A. B. Domonoske and R. H. Stalnaker, chairman and speaker at the Maintenance Session, look over the program.**

**Northern California Section Chairman A. H. LauFer *(right)* took an active part in the meeting.**

**Prof. Llewellyn Boelter *(lower right)* spoke on safety.**

Continuing with the Safety Session the second paper of the morning, entitled, "The Performance of Automotive Lighting Devices," by L. Boelter, professor of mechanical engineering, University of California, and W. R. Sharkey, Jr., inspector of lights, California Motor Vehicle Department, was read by Professor Boelter.

Professor Boelter included in his discussion only such things as tail lights, clearance lights and reflectors. By means of slides the audience was shown testing devices used at the University of California to show the effect of vibration, dust, and moisture on lighting devices. A number of charts were projected for the purpose of showing the light values required from

various styles of lights at given distances in front and at the sides.

Professor Boelter expressed his disappointment at the low percentage of what could be termed good lighting devices. Much of this is apparently due to the fact that their manufacturers are apparently unable or disinclined to do a good designing job or to realize the objective for which they are striving. Failure from physical disintegration, marked decrease in efficiency due to the easy entry of dust and/or moisture, account for many of the light troubles which the motor vehicle operator finds upon him before he is aware of their existence. Professor Boelter pointed out that while the condition is still unsatisfactory he does not consider that improvement is lacking.

Turning to the question of the lamp bulbs and the electrical system he remarked that what might be called "gyp" lamps accounted for a high percentage of the deficiencies. Improper cementing of the glass into the base and inaccurate filament placement constitute major offenses. The marked effect of low voltage to the lamp itself on the amount of light put out by the lamp was emphasized and demonstrated. A large amount of truck wiring is either initially inadequate or has been allowed to become so by development of resistance losses at contacts and connections in general. Mr. Sharkey furnished those present at the meeting with an information bulletin regarding truck wiring. He pointed out that the State is endeavoring to assist truck operators in improvements in this direction.

Following a brief adjournment, 58 of those in attendance were seated at the luncheon, which was under the chairmanship of Melvin N. Lefler, chief development engineer, Lundelius & Eccleston, Los Angeles. The principal speaker at the luncheon was A. K. Brumbaugh, West Coast representative of Timken-Detroit Axle Co., who started out with reminiscences upon his 21 years of SAE membership during which period the industry has seen, probably as one of the outstanding achievements, the advancement in the precision of measurement.

Following these preliminary remarks, Mr. Brumbaugh chose as his subject a "Midwest Engineer's Comment on West Coast Operation" and his long connection with the industry in the East and in the West appeared to qualify him well for his remarks.

## Active at Meeting

**W. S. Crowell, secretary of the Northern California Section, was a busy man at the West Coast T. & M. Meeting.**

To Mr. Brumbaugh's way of thinking, the Pacific Coast has not been tied down by tradition and inhibitions and has probably an unusually high quota of informal experimenters in the direction of seeing just how much a motor vehicle can possibly carry. While in the East a truck and trailer is so loaded that it has some performance in high gear, Western tendency seems to be to set the load limit at just what the vehicle can stagger under on level ground in high gear. Then, when a hill is arrived at, the several compound transmissions which have been provided permit the vehicle and load to be screwed over the top of the hill. At that point another divergence between the Pacific Coast and Eastern Practice comes in evidence as, in the West, the proper thing to do seems to be to let the trailer brake do the work of descent, perhaps due to the convenient location of the vacuum brake lever to the driver's hand, while in the East, the entire vehicle train is braked.

Mr. Brumbaugh commented on the often discussed effect of fly-by-night designers and operators who, by their unsound and hence less expensive operations, can seriously interfere with profits which soundly conducted business must have to continue in business. Not entirely condemning such operations he pointed out that often very ingenious and helpful things came from these builders (whom he differentiated from designers) and their ability to produce special devices on a one-at-a-time basis was contrasted with the problem of mass production which must be planned months in advance and is of necessity based on the production of a large quantity of any one item.

The last afternoon of the meeting constituted an Operation Session under the chairmanship of E. W. Templin, automotive engineer, Los Angeles Department of Water and Power. The first paper presented concerned "Progress in Tire Design – 1932 to 1937" as viewed by B. Darrow, manager, Technical Service Division, Goodyear Tire & Rubber Co., Los Angeles. Pertaining to the steps in the progress of tire manufacture, Mr. Darrow spoke of the giant 600-lb. tires used on earth moving machines and capable of carrying loads of 16,000 lb. per tire. Another development mentioned was the use of rayon rather than cotton in the construction of tires, because the former is far more resistant to deterioration from heat. At the present time the high cost of rayon tires limits them to use on motor trucks where temperatures from 200 to 250 deg. fahr. inside the tire are encountered under conditions of heavy load and high speed.

In concluding his remarks, Mr. Darrow mentioned the use of water in large tractor tires to increase weight and improve traction. He also spoke of the problem of tire noise which has been accentuated by the development of quieter cars. Noise has to a large degree been overcome by uneven spacing of the buttons or other designs which go to make up the non-skid tread of the tire, although the variations are of such small magnitude that the tire must be inspected closely to detect them. Another problem of today's driving is that of tire balancing which is vital for speeds of 60 m.p.h. or higher and which are encountered by the motorists of today.

Two other interesting problems of the tire manufacturer include that of entrapped air resulting from drop center rim tires which seal themselves to the rim in an airtight fashion. The slow diffusion of air through the tube can find no way to escape and finally blows the tread off. The simple remedy of punching a small hole through the side of the casing or in some other manner permitting the air to escape corrects this trouble.

As the closing paper of the meeting, Francis S. Weaver, Pacific Coast representative of Allen Electric and Equipment Co., San Francisco, read a paper on the "Importance of Motor Tune-Up."

He pointed out the necessity of using accurate tune-up instruments to keep today's automobile engines in adjustment to maintain the efficiency to which they are designed and adjusted at the factory. Not only must the tune-up equipment be adequate but it must be capable of being used effectively by the class of labor which does this type of work.

In discussion, Mr. Jackson, of United Motors Service, emphasized the manufacturers' viewpoint that it is essential to work to car manufacturers' standards in all tune-up operations. He specifically commented on the problems resulting from the use of voltage regulators and pointed out that in the manufacture of these devices considerable more time is required to accomplish final adjustments than is needed to do the construction work on the device. With this in mind it is obviously essential that similar accuracy be followed in the tune-up adjustment of these intricate devices. In the test of condensers Mr. Jackson emphasized the importance of internal resistance as well as other of the condenser characteristics which are occasionally overlooked.

Mr. Edgar, of Shell Oil Co., laid emphasis on the fact that a distributor perfectly adjusted by means of a syncrograph would not necessarily guarantee proper performance on the car by reason of torsional vibration of the distributor driving mechanism to the end that timing is not uniform for all cylinders in the engine. It has been his experience that 9 gasoline complaints out of 10 can be traced back to poor ignition timing, most of which is in the distributor. He expressed hope that there could be designed a syncrograph which could be used on the car and also confirmed the necessity of chassis dynamometer and road testing.

Mr. Stewart, of the Faber Laboratories, Inc., a concern which specializes in crankcase oil analyzers for fleet operators, presented a point of view "From the Inside of the Crankcase." From this vantage point, said Mr. Stewart, can be seen the most pleasing objects, namely, dollar signs. Resulting from a partial tune-up on a fleet of 200 vehicles gasoline mileage increased from 8.77 to 9.01 and effected a saving of 1553 gallons of gasoline during a 5-week period. Upon completion of the motor tune-up the gasoline mileage increased to 9.61.

J. R. MacGregor, Standard Oil Co. of Calif., questioned the correctness of saying that an exhaust gas analyzer is a micrometer and pointed out that when factors of gasoline, valve and cylinder temperatures and the effect of different combustion materials on combustion analyzer readings are considered, it is not possible to draw too fine conclusions with accuracy. He confirmed Mr. Edgar's statements that distributors set on a syncrograph do not produce equivalent results on the engine necessarily and spoke of a variation of between 70 and 91 on octane rating between a distributor tested on a syncrograph and actual engine performance. Mr. MacGregor further cautioned against drawing too general conclusions on gasoline and air ratio before full knowledge of the properties of the gasolines used, and was reassured by Mr. Weaver that the figures quoted in the paper were general averages and not intended for any specific group of gasolines.

F. R. Elliott, Ethyl Gasoline Corp., presented data obtained by supercharging a Chevrolet truck engine by means of a centrifugal blower independently driven by an Austin engine. Mr. Elliott's remarks covered the effect of supercharger pressures up to 5 lb. which raised the power output of the engine from 91 atmospheric to 158 at 5 lb. supercharging with an 87-octane gasoline. Fuel consumption dropped from a 0.62 atmospheric to a 0.52 at 5 lb. of supercharge. The performance of the truck in hilly country with identical load and constant motor speed showed clearly the gain occasioned by supercharging.

# SAE Papers in Digest

**HERE are digests of papers presented at various meetings of the Society.**

**Some of these papers will be printed in full in the SAE JOURNAL.**

**Mimeographed copies of *all papers received* will be available, until current supplies are exhausted, at a cost of 25 cents per copy to members; and at 50 cents per copy to non-members, plus 2% sales tax on those delivered in New York City. Orders for mimeographed copies must be accompanied by remittance and should be addressed to Sessions Secretary, Society of Automotive Engineers, 29 West 39th St., New York.**

## Section Regional Transportation Meeting – Chicago – Sept. 29 to Oct. 1

### Rating a 14,000-Lb. Gross-Vehicle-Weight Truck – *Fred L. Faulkner, automotive engineer, Armour & Co.*

THE subject of motor-vehicle rating has been under discussion for several years, and considerable time has been spent by the Transportation and Maintenance Activity of the Society, and also by a Rating Committee, in attempting to evolve a satisfactory and consistent means of evaluating a motor truck by means of formula, and so on.

This paper outlines a method for establishing ratings on motor vehicles and, specifically, criticizes the 14,000 G.V.W. offering of five prominent truck manufacturers in the hope that these manufacturers will establish the method used to determine their ratings.

The aim of the operators as a class in this work is given as finding a clean-cut means of allocating given vehicles to a specific job – and not to attempt to design motor vehicles.

### The Evaluation of Extreme-Pressure Lubricants – *Clyde A. Crowley, director of research, Technical Service Bureau, Inc., and F. A. Faville, Faville-LeVally Corp.*

AFTER briefly discussing the history of methods employed in evaluating extreme-pressure lubricants and pointing out certain features which have been the subject of considerable discussion, this paper endeavors to show that it is essential to make a thoroughly scientific and intelligent evaluation of the characteristics of any test machine before it is possible to develop procedures which will enable the machine to be used for the identification of those characteristics of an extreme-pressure lubricant which service records indicate as essential.

A complete analysis of one test machine is presented, together with data which indicate both the possibilities and limitations of the machine as a test unit. Studies are presented which show definitely the effect of viscosity, machine speed, wiping rate, rate of load application, and other variables.

### Retreading – *Philip H. Smith, Technical Investigator.*

THIS paper attempts to answer three questions of major interest to fleet owners: "Does retreading pay? By what standards can retreaders and their work be judged? How can fleet retreading be handled with maximum saving?"

The author sketches the background of the retreading business with its maze of contradictory opinion and conflicting interests in order to reveal the pitfalls which lie in wait for the uninitiated. From this background he derives certain basic facts which will help fleet operators to obtain possible benefits without suffering easily incurred losses. Prevailing retreading practice is described and the course of its future development suggested, so that the operator will have some sound ground upon which to base his judgments.

### Twenty- to Twenty-Five-Passenger Bus Design from the Operator's Viewpoint – *H. O. Mathews, automotive engineer, Public Utility Engineering & Service Corp.*

PURPOSE of this paper is to present the problem of selecting a bus for the most economical operation for a given fare on a given route, within the size range indicated. Fundamentals to be kept in mind when selecting a bus are discussed under headings of passenger appeal; riding comfort; ease of ingress and egress; probable life in miles; changes in design during its life; cost of chassis and body maintenance; gasoline mileage; tire costs per bus mile; and speed required to maintain schedule.

The paper includes a comparison of different types of these vehicles that are now on the market, outlining the advantages and disadvantages of each on the basis of the fundamentals listed previously.

### Design and Maintenance of Thirty- and Forty-Passenger Buses – *J. A. Harvey, automotive engineer, Pittsburgh Motor Coach Co.*

THIS paper reviews the development of the design and construction of thirty- and forty-passenger buses, and discusses the evolution of operating and maintenance methods as practiced at the Pittsburgh Motor Coach Co. Troubles experienced with wooden bodies built on truck chassis of ten and twelve years ago are recalled.

It is shown that gasoline consumption can be reduced practically in proportion to the weight reduction. Figures are quoted to show that maintenance costs and practices have benefited greatly by improved bus design, as well as by improvement in maintenance itself. Developments in both gasoline and Diesel bus engines are reviewed.

## So. California Section Papers

*June 18*

### Engineering Facts in Support of the Camel-Back Truck – *B. B. Bachman, vice-president, The Autocar Co.*

AS specific examples of "camel-back" trucks, engine-under-the-seat and cab-over-engine (C.O.E.) types are defined, giving the special advantages of each for various service applications.

Considerations favoring these types are listed as shorter overall length; shorter wheelbase; improved weight distribution; reduced frame stresses; distinctive appearance; and greater driver comfort. Advantages of each of these features are evaluated by comparison with corresponding conventional trucks.

### Cab-Over-Engine Design – *E. W. Winans, Federal Motor Truck Co.*

THE design feature of the C.O.E. truck with which this paper is concerned principally is the location of the cab and cab door with relation to the front wheels and axles. Consequently the paper consists essentially of aligning the advantages and disadvantages of the "ahead-of-the-axle" and "behind-the-axle" locations of the door and driver's seat from the standpoints of front-axle load, wheelbase, cab entrance, percentage of load on front axle, riding comfort, transmission, accessibility of engine, cab-door hinges, adaptability, visibility, and control.

The conclusion that by far the greater number of advantages and fewer disadvantages seem to be found with the cab and door at the rear of the axle is reported to be confirmed by conversations with salesmen and operators who have driven both of the designs compared.

## Pittsburgh Section Paper

*May 25*

### Has Maintenance Kept Pace with Transportation? – *O. M. Brede, General Motors Truck & Coach, Division of Yellow Truck & Coach Mfg. Co.*

TO show that maintenance methods have not kept pace with development, this paper reviews the rapid evolution of transportation. The view is expressed that no systematic plan of maintenance is observed universally, differentiating between the meaning of the word "maintenance" and that of "repair."

A fleet failure is studied to emphasize the results of entrusting expensive equipment to low-paid and inexperienced men.

In conclusion the paper sets forth in considerable detail an outline of the General Motors Truck & Coach preventive maintenance system.

## Metropolitan Section Paper

*October 14*

### The Motorization of Germany and the Competition Between Railway and Motor Car – *Dr. Ernst Esch, professor of motor transport science, University of Cologne, Germany.*

TO show the recent progress of the motorization of Germany, figures are quoted showing that the number of cars and trucks in operation has doubled during the past five years. A further upward surge is expected upon completion of the development of the "peoples' car," which is expected to attract new buyers in the lower price levels.

Government assistance, reorganization of the road system, and the improvement in Germany's economic position are given as causes of Germany's progress in motorization.

German traffic laws are differentiated from those of other countries. The German National Motor Highways Program is described in considerable detail.

In a comprehensive discussion of the competition between the railway and motor car in Germany, the author indicates that the pressure of the motor car is not yet dangerous for the railway, but that motor transport will secure a larger slice of the total in the future – and that both will be watched and regulated for the common good by the Government.

## Tulsa Group Papers

*November 5*

### Relation of Cleanliness to Better Lubrication and Motor-Car Economy – *L. C. Eldridge, Shell Petroleum Corp.*

THIS paper attempts to explain why the automobile depreciates much more rapidly than does industrial equipment, and offers as a solution the application of one basic rule: the use of clean oil in a clean motor.

(*Continued on page* 40)

# *What* Foreign Technical Writers Are Saying

## AIRCRAFT

**Nouvelle Méthode Expérimentale d'Etude en Soufflerie de la Stabilité Longitudinale Statique des Avions**

By R. Marchal, P. Simon and M. Delluc. Published in *L'Aéronautique*, August, 1937, *L'Aérotechnique* section, p. 77. [A-1]

The new method for studying, in the wind tunnel, the static longitudinal stability of aircraft was evolved for the testing of the "Pou-du-Ciel," when the methods then current were found to be inapplicable to this unconventional aircraft. While the new method may be generally used, it has been found particularly advantageous where the reciprocal interactions between wing and control surfaces must be taken into account.

An aerodynamic vane on which the model is mounted is the essential experimental instrument for the use of the new method. For different elevator settings of the model, its state of equilibrium, stable or unstable, is noted. From this data may be traced, for the chosen balancing position, the curve showing the zones of equilibrium of the model. Methods of analyzing the curves are discussed, and the agreement between the test results and those obtained in flight is demonstrated. Manoeuverability and controllability may also be studied by the aid of the new method.

From their study of the method, the authors conclude that it is now possible not only to determine in the wind tunnel the limiting positions of the center of gravity compatible with static stability, but also to study the effect on performance of displacements of the center of gravity. Design development is hence facilitated, and, through the opportunity for carrying out in the wind tunnel investigations for flight conditions not easily attainable in full-scale testing, the way is opened for increasing the safety of the airplane when such abnormal positions are accidentally reached.

**Neu Ritzgeräte für die Luftfahrt-Forschung**

By Heinrich Freise. Published in *Luftfahrt-Forschung*, Aug. 20, 1937, p. 373. [A-1]

Most physical forces of interest in aircraft research manifest themselves in movements, the magnitude of which, and hence of the force involved, may be defined by a straight line. Examples are: for load on a spring, its deflection; for pressure, the movement of a membrane; for stress on a structural part, its deformation. Such movements, for the most part, are of small and constantly varying magnitude. Instruments to record them must be light in weight and small in size; rugged, to resist weather and rough handling; free from inertia; accurate and capable of producing a lasting record.

The German Institute for Aeronautical Research in developing instruments for the measurement of small lines representative of forces has found mechanical lever enlarging systems unsatisfactory. In its instruments, the line is scratched in actual size by a diamond, on a more or less hard surface, and the record subsequently read by a microscope, magnifying glass, or by means of microphotography. Lines up to 1.5 mm. in length are recorded on glass or steel cylinders; longer lines, on film.

A whole series of such instruments, adapted for various purposes, has been developed, and the construction, operation, and control methods of instruments for measuring the following are here described: starting and landing stresses in the floating gear of seaplanes; accelerations of the center of gravity of aircraft; dynamic pressure; shock forces in the unfolding of a parachute; stresses produced in aircraft by glider towing cable; engine speed; aircraft vibration on test stand and in flight.

Freedom from inertia, accuracy and simplicity are claimed for the instruments.

**Theoretische und Experimentelle Grundlagen für die Unterschung und Entwicklung von Flugzeugfederungen**

By Franz Michael. Published in *Luftfahrt-Forschung*, Aug. 20, 1937, p. 387. [A-1]

To set forth fundamentals for the quantitative evaluation of airplane spring suspensions and to contribute toward uniformity in the testing of such suspensions are the objects of this report. In it the German Institute for Aeronautical Research discusses the theoretical and experimental fundamentals for the investigation and development of aircraft suspension.

Requirements and operation of airplane springs are first covered in a general, summary fashion; standardized definitions and equation symbols are suggested, and two ideal loading conditions, landing and rolling, are described and diagrammatically expressed. In developing the theory of simple suspension, equations applicable to each of the two ideal loading conditions, and their solutions, are set forth. In connection with the solutions, three questions are examined in detail; duration of the impact, damping and hysteresis. Double suspension, that is, inclusive of both tires and springs, are considered under three headings; interaction of forces between tires and springs, time rate of deflection and equations for the landing shock in double suspension.

For the representation of spring characteristics, a substitute for the usual load-deflection curve obtained under a given loading condition is proposed. This substitute characteristic diagram is made up of a series of curves, each curve representing, for a given deflection, the relation between spring load and time rate of deflection. Examples of such diagrams for a simple suspension are given, and methods of their graphical interpretation are explained. To obtain the data for such diagrams, the German Institute for Aernonautical Research uses a shock testing machine. Its design is described, as well as its operation to produce results including the effect of landing gear and tire action, and of cushioned impact.

**La "Ressource" et le "Looping" dans le Pilotage Automatique par Girouettes Constantin**

By J. Mottez. Published in *L'Aéronautique*, September, 1937, *L'Aérotechnique* section, p. 93. [A-4]

Previous flight tests with the Constantin system of automatic piloting have confirmed the accuracy of the theoretical analysis of the behavior of the system. It is now proposed to determine theoretically its applicability to the manoeuvers of leveling out and looping.

A mathematical analysis is first made of these two flight cases, for a perfectly designed airplane equipped with an ideally adapted Constantin vane system. Various influences apt to be present in actual practice are then introduced into the study to note their effect on the theoretical behavior. The conclusion

**The letters and numbers in brackets following the titles classify the articles into the following divisions and subdivisions: *Divisions*—A, Aircraft; B, Body; C, Chassis Parts; D, Education; E, Engines; F, Highways; G, Material; H, Miscellaneous; I, Motorboat; J, Motorcoach; K, Motor-Truck; L, Passenger Car; M, Tractor. *Subdivisions*—1, Design and Research; 2, Maintenance and Service; 3, Miscellaneous; 4, Operation; 5, Production; 6, Sales.**

## I.A.E. Papers Available

The Institution of Automobile Engineers, England, publishes in pamphlet form copies of papers read at its meetings, complete with discussions and the authors' replies thereto, according to word received from Brian G. Robbins, secretary of the Institution. These can be purchased at reasonable prices from Mr. Robbins' office at 12, Hobart Place, London, S.W.1.

Most of the papers which have been presented since the Institution was founded in 1906 are available. A list of those read during the 1936-1937 season may be obtained from the SAE library at 29 West 39th St., New York.

drawn is that the Constantin direct-action vane system of automatic piloting will permit even a pilot of little experience, almost without practice and without error, to loop and level out an airplane along predetermined paths.

### Le "Bilan Aérodynamique" de l'Avion

By A. Verdurand. Published in *L'Aéronautique*, Sept., 1937, *L'Aérotechnique* section, p. 99. [A-4]

Arguments and suggestions for a standardized aerodynamic balance report for aircraft, similar to the heat balance records of engines, are here set forth. Such a report would itemize all aerodynamic sources of power loss or consumption, together with the amounts of power lost or consumed, the sum of which would equal the total effective engine output. Universal agreement should be had on the items to be included in such a balance sheet, and on the methods of measuring or calculating the power losses involved.

A previously published English report itemizing sources of aerodynamic loss for a large number of British and American airplanes is reproduced in part, and comments made on it to indicate the manner in which the suggested aerodynamic balance sheet would serve airplane designers or users. Points covered are: the importance of friction drag in modern aircraft; the reduction of wing area as a method of total drag reduction; the aerodynamic superiority of American transport ships; retractable landing gear merits; and the relative advantages of monoplane vs. biplane, various types of biplane and single vs. dual engine craft.

A list of items to be included in the aerodynamic balance is suggested, and, as an example of progress already made in studying methods of measuring aerodynamic power losses, work done in England with reference to friction drag is summarized.

## CHASSIS PARTS

### Worm Gearing

By W. A. Tuplin. Published in *The Automobile Engineer*, September, 1937, p. 337. [C-1]

The author in this article undertakes a comprehensive survey of modern automobile drives. He deals with the essential character of worm gears, their tooth and tread form, line of contact, zone of contact, motion of contact lines, involute helicoid, other thread forms, worm wheel teeth, load capacity, relative load capacity of worm gears and bevel gears, efficiency, material and manufacture, working loads on worm and worm wheel, bearings, relative displacement of worm and wheel under load, contact bearing, noise, lubrication, wear and pitting, mounting, and standardization.

The demand for quietness and low propeller-shaft line are the factors which are drawing attention to the worm drive for passenger cars.

### Unterschung der Federungseigenschaften von Kraftfahrzeugen an Modellen

By E. Marquard. Published in *Automobiltechnische Zeitschrift*, Sept. 10, 1937, p. 435. [C-1]

While the calculation of spring vibration frequency and amplitude is not prohibitively difficult when damping is not considered, similarly satisfactory mathematical methods inclusive of damping effects are not known. In view of the difficulty of full scale road tests of spring suspensions, the proposal is made to determine spring characteristics experimentally by means of a small scale model vehicle, proceeding from calculations for the undamped system as a basis.

Two characteristics that the model must possess are vibration frequency the same as that of the full-scale vehicle, and vibration amplitude in proportion to its size the same as for the full-scale vehicle. The design rules that must be followed if these conditions are to be filled are set forth, and their application illustrated by an example.

### Berechnung der Verdrehsteife von Fahrzeugrahmen

By O. Hoffmeister. Published in *Kraftfahrtechnische Forschungsarbeiten*, No. 8, 1937, p. 75. [C-1]

A method of calculating the bending and torsional strength of automotive frames, based on the known formulas for beams, is presented.

By means of examples, the effect of type of frame construction and of various means for increasing rigidity is shown. In simple rec-

tangular frames, the most stringent requirement is torsional rigidity of the individual members, and for this purpose tubular members render the best service. Diagonal bracing increases the total torsional rigidity of the frame, even when the individual members have only slight rigidity. The design and construction of the junction piece at the intersection of the diagonal braces is shown to be of greatest importance.

This investigation was carried out at the Stuttgart engineering college as part of the German transport ministry's research program.

## ENGINES

### Beitrag zur Entwicklung des Quarzindikators und seine Anwendung

By Lothar Bisang. Published in *Kraftfahrtechnische Forschungsarbeiten*. No. 8, 1937, p. 82. [E-1]

A description is given of the quartz indicator developed in the automotive and automotive engine laboratory of the Stuttgart engineering college, as adapted for the measurement of both liquid and gas pressure.

Other experiment apparatus used to supplement the indicator is also described – instruments for determining dead-center, ignition point and the stroke of the jet needle in an injection engine. Certain special questions are discussed – the measurement of differences in pressure, as in the precombustion and main chamber of a Diesel engine; vibration effects in the oscillograph, and the order of magnitude of the piezo-electric effect. Typical diagrams produced by quarz indicators are reproduced and explained.

### Untersuchungen an Fahrzeug-Gaserzeugern und Reinigunsanlagen

By Hugo Finkbeiner. Published in *Kraftfahrtechnische Forschungsarbeiten*. No. 9, 1937, p 91. [E-1]

As part of the German program to produce all automotive transportation materials from domestic sources, the German transport ministry and army authorities sponsored this investigation of gas producers at the Darmstadt engineering college. Its object was to show along what lines gas producer development must proceed, in order that solid fuels may win a lasting place for automotive operation along with liquid fuels.

A series of comparative tests under the same conditions was made of six gas producers of varying design and operating principles, and adapted for the burning of wood, charcoal, anthracite, lignite and bituminous coke. The points investigated were the composition and ignition characteristics of the gas, engine power under full load, and the behavior of the gas producer under changing load. In discussing the test results, methods of calculation applicable to gas producers are set forth, and fundamental design requirements for such engines are enumerated.

A special section describes an investigation of the efficiency of gas cleaners and gives data on the dust content of the gases.

### Untersuchungen an Zweitakt-Motoren

By U. Schmidt. Published in *Kraftfahrtechnische Forschungsarbeiten*, No. 8, 1937, p. 65. [E-1]

The present, fourth, report on an investigation of two-stroke cycle engines, carried out at the Berlin engineering college as part of the German transport ministry's research program, deals with the degree and variations in charging efficiency.

In the port-controlled, two-stroke cycle engine with crankcase pump, the charging efficiency varies with engine speed, hence it is said to owe its characteristic course to the damped, natural vibration of the crankcase pump inlet system. Variations in charging efficiency calculated by means of formulas for damped vibration are found to be in agreement with those experimentally determined. Also are determined the effect on charging efficiency of crankcase pressure, temperature and volume, varying port angles with constant port area and asymmetrical cam diagrams.

With this knowledge of charging behavior, it is said to be possible to determine easily the effect of changes in port timing, inlet manifolds and crankcase, and to fix the maximum charging efficiency at the desired point in the cycle for the average engine speed.

### Engine Lubrication

Report by H. R. Ricardo. Published in *Engineering*, Oct. 22, 1937, p. 467 and Oct. 29, 1937, p. 476. [E-4]

This constitutes a report rendered by H. R. Ricardo covering the thirty papers presented in Group II of the General Discussion on Lubrication and Lubricants, Institution of Mechanical Engineers, October, 1937, dealing with the lubrication of internal-combustion engines, and several in the other groups which have some bearing on the matter.

Mr. Ricardo reports that the most popular subject is that of cylinder-bore wear, involving the opposing corrosion and abrasion theories.

Some interesting points which Mr. Ricardo believes worth mention are the following:

(a) S. B. Freeman has found that large additions of new oil to old increase sludging, so that make-up oil should be added gradually.

(b) A. E. Flowers suggested that the fine

carbon in used oil has the beneficial effects of colloidal graphite.

(c) O. T. Jones and E. E. Turner quote figures which show that the large improvement in oxidation resistance obtained by modern refining methods is not accompanied by any loss in lubrication quality.

(d) J. M. Auld and H. J. Nicholson point out the importance of minimizing aeration in the circulating system, particularly in engines with oil-cooled pistons.

Other subjects covered in the review of papers are oil consumption, bearings, and filtration.

## MATERIAL

### Les Alliages de Magnésium dans les Constructions

By H. Portier. Published in *Arts et Métiers*, June, 1937, p. 126. [G-1]

Concrete engineering data on magnesium alloys is here set forth for the benefit of the practical designer charged with the design of parts, their machining, assembly, repair, and adaptation to the chemical conditions under which they must operate.

A section deals with the substitution of magnesium alloys for other materials of aircraft construction, and a comparison is made of the suitability of chrome-nickel steel, an aluminum alloy and a magnesium alloy for various types of part. Three physical properties are of importance in considering such substitution, elastic limit, modulus of elasticity and density.

The physical properties of cast magnesium alloys are given, and rules for the design and dimensioning of cast pieces laid down. For cases where steel parts must be countersunk into cast magnesium alloy pieces certain special precautions are to be followed. Methods of assemblage are discussed, and welding is recommended and information concerning its proper execution given. Magnesium alloys may be machined easily and at high speed; machining tools and processes are briefly dealt with. The aircraft, automotive and textile industries use magnesium alloys for a large number of purposes here cited.

### Der Elastizitätsmodul von Kolbenringwerkstoffen

By C. Englisch. Published in *Automobiltechnische Zeitschrift*, Sept. 10, 1937, p. 431. [G-1]

For reasons given, the modulus of elasticity has an important influence in piston ring performance. For a circular piece, this property cannot be determined, as for a straight piece, by direct measurement of tension and elongation. A bending test, with observation of the deformation and forces involved, is needed.

Two methods of applying the loading in such a test are: first, two forces applied along the diameter perpendicular to that passing through the slot; second, loads applied at the ends of the slot and tangential to it. Formulas for calculating the modulus of elasticity from the results of such bending tests are developed. Apparatus for determining the values required are, for the first loading case, two plates with parallel faces or a tension testing machine, and, for the second loading case, a steel band enclosing the ring, and a scale for direct measuring of the tension with the ring slot closed.

Factors affecting piston ring elasticity discussed are: the amount and distribution of graphite; quenching methods; alloys and piston ring tension.

### Beitrag zur Technologie und Metallurgie von Lagermetallen

By F. Bollenrath, W. Gungardt and E. Schmidt. Published in *Luftfahrt-Forschung*, Aug. 20, 1937, p. 417. [G-1]

Ten bearing metals of various chemical composition were tested as to hardness, tensile and compressive strength, durability under bending stress and heat conductivity. Tests were conducted at room and at higher temperatures. From the results given, the following conclusions are drawn as to the suitability of various alloys for specific purposes: metals with a lead-tin basis are satisfactory for medium loads at not too high temperature; metals of from 80 to 95 per cent tin content may be used for higher loads, but at lower temperatures; cadmium base metals stand up under still greater loading, but, at the present state of their development, require low temperature; copper lead and aluminum base alloys resist both high-loading and high temperature.

Since, in copper-lead alloys, lead distribution affects so decisively the friction characteristics of the metal, various expedients for improving this distribution were investigated. Included were five methods of casting the bearing, various smelting procedures and the addition to the lead-copper base of small amounts of other alloys. The investigation showed that from a pure lead bronze, in a high frequency induction furnace, a bearing alloy can be produced with a fine and uniform lead distribution, even when lead content is high. Antimony, zinc, sulphur and phosphorus, used as a third alloy in a copper lead base, were found to hinder the fine and even distribution of the lead. Nickel, manganese, cobalt, iron and silicon, in small quantities, produced no harmful effects. The conclusion drawn is that third alloys are to be avoided.

**Einfluss der Heeresmotorisierung auf die Entwicklung des Synthetischen Kautschuks in Deutschland**

By W. Philipps. Published in *Zeitschrift des Vereines Deutscher Ingenieure*, April 3, 1937, p. 397. [G-3]

Exigencies of the World War forced a premature use of synthetic rubber, then only in the first stages of its development. After the war, its possibilities were neglected, until 1926, when the high price of natural rubber stimulated research on its substitutes. Subsequently, reduced prices of natural rubber again caused a withdrawal of interest from the synthetic product. This interest was forcibly revived in 1933, when the National Socialist regime declared for the motorization of Germany, and for the domestic production from domestic resources of material for such motorization.

Since that time the development of synthetic rubber has been carried out under the auspices of the army, which has set as its aim not merely a rubber substitute, but the best possible material for tires. More than 14,000 synthetic rubber tires have been used on army vehicles, operated about 2,500,000 vehicle miles. In the practical army tests of such tires, about 200 men and 60 vehicles are now occupied. Recently their usage has been extended to the mail service, commercial motor transport companies, motorcoaches and high-speed passenger cars. For them are claimed the ability to operate at speeds as high as about 90 m.p.h., wear resistance about 20 or 30 per cent higher than that of tires of natural rubber, and insensitiveness to high and low temperature.

The army's present demand is that all rubber used in any part of its motor vehicles shall be of the synthetic type. Efforts are also being made to develop a domestically produced artificial silk carcass to replace cotton fabric. The four-year plan provides for the total replacement of natural by synthetic rubber.

## MISCELLANEOUS

**Proceedings of the Institution of Mechanical Engineers.**

Vol. 135, January-May, 1937, 586 pp. [H-3]

Articles of particular automotive interest contained in this volume of the proceedings are the following:

Piston Temperatures in a Sleeve Valve Oil Engine, by H. Wright Baker.

Racing Motor Car Design, by R. A. Railton.

## MOTORCOACH

**Strassenfahrzeuge aus Leichtmetall — eine Zeitgemässe Betrachtung**

By Heinz Brauer. Published in *Automobiltechnische Zeitschrift*, Sept. 10, 1937, p. 425. [J-1]

With the slogan, save on fuel and tires, the author aims to popularize the use of light alloys in automotive construction, most specifically for motorcoach bodies. Examples of light-alloy motorcoach body construction shown at the latest Berlin show are cited, for which weight saving up to 2000 lb. is claimed.

That the light alloy should be used not wherever possible, but only where the increase in material cost is offset by the decrease in labor cost is the rule laid down in the theoretical discussion of light-alloy motorcoach body design. Specific aspects referred to are: stress distribution; strength, elasticity and elongation, in which respects the light alloy is compared favorably with steel; the choice between riveting and welding, with the preference indicated for the former; and the effect of weight decrease on riding qualities, with emphasis laid on the necessity for suitable design of the suspension system. The saving in fuel and tires for a light-alloy body motorcoach over a period of four years is calculated.



# SAE Papers in Digest

(*Continued from page* 35)

Three reasons are given for the more rapid deterioration of automotive equipment: (1) speed, load, and operating conditions are more constant for industrial equipment; (2) industrial equipment operates at more uniform temperatures; and (3) in view of the preceding conditions, industrial equipment can be supplied with a lubricant more accurately suited to its needs.

By far the most essential of the recommendations given for prolonging the useful life of the automobile, in the author's opinion, is to give it the best lubrication possible.

### Why Use Good Lubricating Oils? – *R. R. Sloan, Buda Engine Service of Tulsa.*

THIS paper is concerned primarily with the selection of a proper lubricant for internal-combustion engines, although it also deals with the maintenance of oil purity in service. Fundamentals of lubrication are reviewed, and the requirements of automotive lubricants are listed. Three general ways are set forth to classify the contamination of crankcase oil: dilution, oxidation, and dirt. The necessity for adequate filters is emphasized.

It is recommended to buy an oil that is chemically stable, readily forms a tough heat- and pressure-resisting oil film, and has the ability to separate easily from impurities – an oil of the best quality produced by a reliable refining company.